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ANNUAL ADDRESS

OF

CHIEF JUSTICE DALY, LL.D.,

PRESIDENT.

GEOGRAPHICAL WORK of the WORLD in 1877.

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1878

XUM

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ANNUAL ADDRESS

OF

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GEOGRAPHICAL WORK OF THE WORLD IN 1877.

The geographical work of the year 1877 has been as widely distributed over the earth's surface as in the years immediately preceding; and if the same activity continues to prevail for some years to come, there will be no part of the earth that will not become known, unless the physical obstacles are insurmountable. The geographical explorations during the year have been chiefly in Africa, Central and Eastern Asia, in the islands of the Indian Archipelago, in Australia, in certain parts of South America, and in our own Western Territories. An unusual number of expeditions for geographical exploration have been organized during the year, to which I shall have little occasion to refer, as some are yet in a state of preparation, and many that have started have not yet been heard from.

Before reviewing what has been done in unknown or imperfectly known parts of the globe, I shall call attention to those general labors which affect the earth as a whole, and which are embraced under the comprehensive title of Physical Geography; and to those discoveries during the year which add to our knowledge of Ancient Geography, and those which throw light upon the interesting subject of the early existence of man.

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PHYSICAL GEOGRAPHY.

The important branch of Physical Geography has not received such material contributions during the past as in the preceding year, when so many facts were ascertained respecting the depth, the temperature, and the nature of animal life in the ocean, through the scientific voyage of the *Challenger*. The materials obtained in that important voyage have been so great that the attention of scientific men during the year has been, as it will be for several years, devoted to the consideration of the facts which have been accumulated. One result of the English expedition to the Arctic is the confirmation of the discovery of Dr. Bessells, of the *Polaris*, of the junction of two important tides in the larger part of Smith's Sound, creating the impression that a new type of tide has been ascertained, occurring every eight hours. This tide it is obvious is not the one from Baffin's Bay or from Behring's Straits, for it could only have come around from the east coast by a northern route, and its existence tends to confirm Sir George Nares's theory that Greenland is an island. I may also mention, in respect to the tides, that the prevailing opinion that the ordinary tide-tables are sufficient for the practical purposes of navigation has been called in question by such men as Sir William Thompson and Capt. Evans, in consequence of which the British Government has granted £4,000 for the investigation of the tides in the Southern Hemisphere, the Mediterranean, and other parts of the world.

Much attention has been given during the year to the question of the shifting of the earth's axis. It has hitherto been assumed, upon the authority of great mathematicians, such as La Place and Le Verrier, that very little change can take place in the earth's axis, from known mathematical and physical laws. This conclusion, however, has been disputed, especially since the discovery by Agassiz

and others of the existence in the past of a great glacial epoch, during which a large portion of the northern and of the southern hemispheres were successively capped with ice, the evidence of which is found in the extensive distribution of boulders over the northern and southern hemispheres, with scratchings and groovings of rocks and other changes upon the surface of the earth, evidently produced by the action of ice upon a most extensive scale.

The opinion is gradually gaining ground, that there has been not merely one glacial period, but many, with intervals between, in which a semi-tropical climate prevailed; these changes extending over vast periods of time. It has been ascertained by numerous discoverers within the last quarter of a century, that the ice-bound regions of the Arctic, as well as those of the Antarctic, were formerly very different from what they are now. The fossil remains of vegetation and animal life found especially in the Arctic, show conclusively that in some period of the past the climate there was the same as that which now exists in the southern part of the temperate zone; that a luxuriant vegetation once prevailed in the Arctic, and animals existed there, such as elephants and others, that can live now only in semi-tropical climates.

Within the last few years it has been a prevailing impression, that the explanation of this phenomena must be sought in astronomical causes, which have produced a change in the position of the earth to the sun, either through the movement known as the precession of the equinoxes, or the more complicated one resulting in the eccentricity of the earth's orbit, or else by a change in the position of the earth's axis.

That a movement of the earth's axis is constantly going on, is insisted upon by Dr. Jules Caret in a work recently published by him, which he claims to be the result of the displacement of earth at the poles, which is

carried away by icebergs, and deposited in the ocean of the warm regions where these icebergs melt. He insists that a movement of this kind has always been going on, by which the earth at the poles is lessened and that towards the equator increased, and thereby producing a change of equilibrium. So far, however, as causes now operating are relied upon as a basis for this hypothesis, the amount of earth brought from the polar regions is too insignificant to produce a great change in the axis of the earth, or to warrant his conclusion that, in the past, the shifting of the earth's axis has in this way been so great as to produce such a change in the position of the poles to the sun as to account for the glacial epoch. It is admitted by physicists that any great change of the earth's surface, by certain parts of the earth being greatly elevated, and other parts correspondingly depressed, would produce a shifting of the axis and a change in the position of the poles. Mr. A. G. Waters, in a paper read before the British Association last summer, says that the drying of an ancient sea like the Caspian would shift the pole about 166 feet.

At the coming exhibition in Paris, next June, Foucault's pendulum, which was suspended in the rotunda of the Pantheon, in Paris, to show the movement of the earth, but discontinued when the Pantheon was converted into a church, is to be produced on a more extended scale, and connected by a mechanical contrivance with a large terrestrial globe, by which the movement will be made apparent to the most ordinary observer.

W. L. Watts, who has recently explored the Vatna Jokŏll, or the vast tract of ice and snow in Iceland, over 3,000 square miles in extent, gives as the result of his observations, that this vast mass of ice and snow seriously affects the climate of Iceland, as the ice, by its power of refrigeration, helps its own growth. In his opinion, the interior of Greenland is one vast glacier, and the interior,

he says, is encroaching on the coast. He gives as a further result of his observations that the Gulf Stream is being gradually deflected in a southerly direction, and that a glacial epoch appears to be creeping downward from the north.

A recent survey of the Kosbek glacier in the Caucasus, proves that since 1863 the lower extremity of the glacier has advanced 826 feet down a valley.

H. Von Schlagintweit has made an interesting comparison between the snow limit of the great mountain chain of the Himalayas and the Alps, by which it appears that the snow limit of the Himalayas on the south is 16,600 feet, and on the north 16,200 feet; while the snow limit of the Alps shows an average of 9,000 feet on the north, and 9,200 on the south.

Mr. R. A. Wallace has given attention to the subject of the indication of the antiquity of continents, as shown in the distribution of living and extinct animals. He likens the continents to a great creeping plant, with roots at the North Pole, the matted stems and branches of which cover a large part of the northern hemisphere of the globe, and send three great offshoots towards the South Pole, and which by the peculiarity of their formation, offer great facilities for the transmission of varied forms of animal life. The temperate region of the Old World, by which he means the whole of Europe, the largest part of Asia, and a considerable part of North Africa, he considers the most extensive in its zoological features, and therefore, probably, the most ancient; whilst what he calls the Ethiopian region, that is, Africa south of the equator, including Madagascar, though of comparatively smaller area, is from its tropical climate richer in large animals than any other part of the globe of equal extent. He thinks that the continents of North and South America were formerly separated by a strait running from the Pacific to the Atlantic, which he considers is proved by the circumstance that North and South America have each

a distinct fauna, and by the fact of the similarity of the mollusca of the Pacific Coast and the Caribbean Sea, and that South America was formerly separated into a group of large islands, which he says is indicated by many facts. New Guinea and Australia he thinks were formerly united, and that the low organization of its animals proves that it must have remained almost, if not entirely isolated during the whole of the long period of the tertiary; and he is also of opinion that during the greater part of that period, the ocean and the continents did not differ much from what they are now; and that, as far as the Devonian period, the present continents and oceans were never so completely submerged as to be replaced by oceans to be compared in depth with the Atlantic and the Pacific.

AGE OF THE EARTH.

The late Capt. J. Davis, R. N., made a valuable generalization of the subject of the temperature of the Atlantic Ocean, derived from the results of the voyage of the *Challenger*. Mr. H. P. Mallet, and also the writer of an article in the *Quarterly Review*, have brought together the views of astronomers, geologists, and physical geographers upon the question of the age of the earth, and have shown that there is such a wide diversity between them upon the question of time—a diversity so irreconcilable as to show that our knowledge is not yet sufficiently advanced to admit of any reliable theory as to the age of the earth. Sir John Lubbock has given attention to the subject of the tendency of the land upon the globe to assume a peninsular form, and of the general southern tendency of all the peninsulas, and thinks that this may be due to the great preponderance of the ocean in the southern hemisphere, through the operation of laws which he points out.

METEOROLOGY.

The interest which is now taken in meteorology and the estimation which is entertained of its value is apparent in the regular publication in the London Daily *Times* of the registered meteorological observations of each week at Kew, and of a daily weather chart of an area embracing the British Islands and the contiguous parts of the European Continent, by which the direction of the wind is shown, and its velocity per hour for 100 miles; the distribution of rain and the time when it fell; the daily state of the weather, showing when and where it was clear, cloudy or stormy; the state of the sea and the force of the winds—whether light, fresh, strong, a gale, a violent gale, or a calm, which is noted by words, signs or letters, and to all of which is added general barometical observations. How important this means is has been illustrated by the fact that the great storm which burst over the British Islands and France on the 19th of February last, and produced such disastrous effects, occurred on the very day on which it was announced, four days in advance, that it would occur, by a cable dispatch of the *N. Y. Herald* to London.

THE PHONOGRAPH.

The progress which is made in the extension of the telegraph, and the improvements in its use, comes under the denomination of geographical work, by facilitating communication over the surface of the earth. The telephone is a result of the former, by which sound can be transmitted from one place to another, and I may mention, that during the year it has been ascertained that by means of this invention the human voice can be heard over a distance upon the earth's surface of more than one hundred miles. The year has been fruitful also of another discovery of this nature in the invention of the Phonograph by T. A. Edison, U. S. A., by

means of which words spoken by the human voice can be stored up, transmitted to any part of the globe, and reproduced again, 1000 times if necessary—a piece of mechanism by means of which a message of any length can be spoken on a plate of metal, which plate may be sent to any part of the world, and the message, incredible as it may appear, can by mechanical agency be reproduced so as to be heard in the very voice of the person who sent it. By this extraordinary invention the old familiar voice of a friend no longer living can be reproduced speaking to us, in the very tones and measure to which our ear was once accustomed.

My limits do not admit of a detailed account of this wonderful triumph in physics. I can only say that by means of it sound is first converted into visible form, and the message is translated by reconverting it into sound. The person who receives the strip of tin-foil on which the message is recorded places the strips on the cylinder of an apparatus, and, putting the cylinder in motion, hears his friend's voice speaking to him from the metal.

ANTIQUITY OF MAN.

EARLIEST RACES IN EUROPE.

The investigation of the interesting subject of the antiquity of man has during the year been distinguished rather by some valuable critical papers upon the materials already obtained than by any very striking discoveries. Some caves in the Limestone Hills, in the County of Fermanagh, Ireland, were examined, in which a large number of bones, associated with human remains, were found in cave-earth under stalagmite, and a human jaw was also found imbedded in glacial clay, associated with scratched stones. M. Broca, at the meeting of the French Association at Havre, delivered a

very interesting address upon the fossil remains of early human races in Western Europe. He called attention to the discoveries of M. Denosyers at St. Prest, in France, near Chartres, and of Professor Capellini, of tertiary remains in Tuscany, which, in his opinion, tend to establish the existence of man in the pliocene period of the tertiary. Hitherto it has been clearly proved that man lived during whole of the past tertiary, or, as it is more generally called, the quartenary period, but the antiquity of our race will be greatly extended if the fact of man's existence can be traced to the remote period of the pliocene. What was especially interesting in M. Broca's discourse was a statement in a very concise form of exactly what we know of early man in Europe. So great has been the accumulation of evidence that, in the language of M. Broca, we now know more about man as he existed in the quartenary period than we do of many people referred to in history. The farthest period M. Broca said to which we can put back the historical period, is from 6,000 to 7,000 years, and it may be added that when we have done so, we know comparatively little historically beyond the period of the invention of letters. Nebuhr remarked half a century ago, that when we go up to the dawn of history we find men organized into communities, distributed into nations, and greatly advanced in agriculture, and the more important of the useful arts; while all beyond he said was enshrouded in impenetrable darkness. Within twenty years after this great historical critic said this, Bouthier de Perthes made his remarkable discovery at Abbeville of human implements imbedded in the deposits of the quartenary, revealing the existence of man upon the earth at that early period, which when made known was received with general incredulity, nearly twenty years elapsing before it was accepted as a fact, and from that time, 1858, to the present the evidence has gone on accumulating so rapidly, both in Europe and in this country, that we are

now entitled to speak with certainty of man as he then existed in Western Europe, of his anatomical structure and intellectual development, his mode of life, pursuits, and the progress he had made in the useful arts. The fossil and other remains show that there was in Europe three types, the long heads, or dolicephalic, and the short round heads known as the brachycephalic. Of these two types, M. Broca says that the long-headed are the most ancient; that the short or round-headed, heretofore supposed to have been an autochthenous race who were conquered by stronger and more civilized races from Asia, were in fact themselves invaders of Western Europe, who appeared there only in the later times of the quartenary period. From these two types there are, he says, three early races, called respectively after the names of the places where their fossil remains were first found, Canstadt in Germany, Cromagnon in France, and Furfoos in Belgium, and it is interesting to learn what he has to say of these three early European races, our remote progenitors. The two first, the Canstadt and the Cromagnon, were of the long-headed type, and the third, the Furfoos, was a mixture of the long and the round-headed. The Canstadt, the earliest, was widely distributed. Their remains have been found in Bohemia, Wurtemburgh, in the Rhine provinces, in France, Belgium, and in Italy. They were very savage, more savage than any known existing race. They were robust or short-statured, and had the top of the head much flattened.

Comparatively few fossil remains have been found of this very early race. The earliest was discovered as long ago as the year 1700, and was then placed in a collection at Wurtemburgh, but their importance and value was not ascertained until the year 1835, or 135 years afterwards. The peculiar form of their head exists now only among the Esquimaux and the aborigines of Australia. The forehead retreated rapidly, the cranial capacity was much smaller than that of the

present Australians, or Hottentots. The teeth were prominent, the jaws of great size, and there was a total absence of chin. Their implements were of the very rudest kind, and they had to keep up a powerful struggle for existence against the large animals that then disputed with them the possession of the earth. They existed in Western and Central Europe, as far as known, from the beginning to about the middle of the quartenary epoch, when there appeared another, a stronger, a more perfect and a far more interesting race, which took the place of the Canstadt probably, after nearly exterminating them. This second race was the Cromagnon, which takes its name from a cave discovered many years ago in the valley of the Vezere, in Dordogne in France, and yet within the short time that has since elapsed the discoveries have been so many that this race is now represented by nearly a score of crania, some almost complete skeletons, and by a large number of bones. Though long-headed or dolicephalic, like the earlier race, it differs from the former very materially. This second race (the Cromagnon) were characterized by peculiar bones, to be found now only among scattered individuals, and even then greatly subdued, but which in this race were normal, and distinguish it not only from the race which preceded it, but from all modern races. They lived in France and in Belgium, where their fossil remains have been chiefly found, but they have also been found in Italy, and there is a probability that they exist in England. For such an early race, their type is a very high one; the crania, M. Broca says, being equal to, if not superior to the modern Parisian. As a whole, it approaches the Caucasian, although the teeth project somewhat, and the cheek bones are high. The forehead was straight and high, the vertical diameter well developed, the cranial arch elevated, the lower teeth vertical, and the chin was developed. The whole anatomical structure shows a highly intellectual race, which is further established by their artistic remains, such

as the representation of mammoths and other animals, which were skillfully drawn in outline upon their bone weapons and implements. They lived in France and Belgium in the second half of the quartenary epoch, being contemporary there with the reindeer. Their decline came with the departure of that animal to a more congenial northern home, as the climate of France and Belgium gradually ameliorated. Portions of this race, however, survived in some parts, mixing with new races, and leaving behind them, says M. Broca, lasting anthropological characteristics; for even at the present day their peculiarities occasionally appear in obedience to the law of atavism.

The last of these three races, the Furfooz, were discovered in 1866, in several caves on the banks of the Lesse, in Belgium. They came into Belgium at the end of the reindeer age. They lived in caverns, depended upon the chase, and were inferior to the previous race, the Cromagnons, their weapons, their implements, and their arts being of a much ruder type; but they manufactured pottery, and as it is not found among the remains of the previous races, it is supposed that the Furfooz introduced it. They were of small stature, about on a level with the Lapps of the present day. Their forehead was narrow, low, and retreating, and their bones were exactly similar to our own. With them appeared for the first time a rounded cranial type, announcing the advance in Western Europe of the true round-headed type of man, who was then living on the Danube.

Mr. A. Potter has given an account of the discovery of two skeletons and other aboriginal relics in mounds at Peyson, in Utah, one of the skeletons having in the right hand a large weapon of iron. So much imposition, however, has been practiced in respect to Western discoveries of this description, that they have to be verified before statements can be accepted.

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ARCHÆOLOGICAL.

DISCOVERIES IN ARMENIA.

Mr. Layard has discovered in Armenia a series of interesting antiquities, the sole relics of ancient art that have ever been discovered in Armenia. They are of especial interest, as illustrating the state of the arts there, in Assyria, and generally in Eastern Asia, and the date of their production has fortunately been ascertained by means of an inscription on one of the fragments, and is found to be about 715 B. C. Mr. Layard obtained these antiquities in the city of Van, a city of ancient date, which was in existence a thousand years before the Christian era. Here, Semiramus, the famous Assyrian Queen, was said to have founded a palace with luxurious gardens, where she spent the summer months among the cold and pleasant hills on the banks of Lake Van, returning to Nineveh in the winter.

Mr. A. Chaco has made the important discovery that about fifty of the most ordinary words in the Basque language is identical with the Sanscrit, and as the names of tribes and of many towns mentioned by Strabo and Ptolemy as existing in North Africa, are found at the present day in the Basque country, Mr. Chaco claims, contrary to the prevailing belief, that the Basques are of the Aryan race, and the descendants of the Iberes, who migrated more than 2,400 years B. C., from the cradle of the Aryan race in Central Asia, and came to Europe, where the Basques now are, by the way of Northern Africa, where they have left their traces in the names of tribes and towns.

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DISCOVERIES IN OLYMPIA.

The artistic discoveries made in the excavations at Olympia do not fall within my subject; but I may mention as coming within the range of ancient geography, the discovery of a bronze tablet with inscriptions, mentioning a town hitherto unknown, Chaladrus, and containing inscriptions, the oldest now extant, that date from 600 to 580 B. C. The tablet is a record of a treaty, and the archaic form of the letters and the clumsiness of the style in this uninjured document make it of the greatest importance to archæologists.

CESNOLA AND SCHLIEMAN.

I referred in my last address to the excavations of Gen. Cesnola in Cyprus, and Dr. Schlieman at Mycenæ, to the extent of the information which we then possessed. During the year, however, both gentlemen have published a full account of their discoveries, and we are now able to appreciate them more fully. Gen. Cesnola has done for Cyprus what has long been doing for Egypt. He has enabled us to judge of an ancient civilization extending over many centuries, by means which no history can ever supply. In the statues, busts, portraits, jewelry, the ancient glass, the household utensils, weapons and instruments, we can see the people and know how they lived more than 2,000 years ago. As we go over this interesting collection which has been the fruit of his ten-years' labor, it not only enlarges our knowledge of this ancient people, so diversified in race and so advanced in civilization, but we can trace in the objects before us the progress of that civilization from its early beginning to its maturity. But he has not only supplied us with the means of studying Cyprus and its people, but the collection which he has brought together in the Metropolitan Museum of Art, in this city, sheds a flood of light upon the progress of the arts, among the neighboring peoples of

Egypt, Phœnicia and Greece, and is more reliable and instructive in respect to the development and progress of the arts generally, than anything within the same limits that has ever been brought together.

The discoveries of Dr. Schlieman, the representation and description of which we have in the magnificent volume he has just published, is of equal interest. In a geographical point of view, we have revealed the topography and structure of an ancient and very wealthy city, which was an antiquity 600 years B. C. The tombs and the objects found in them is one of the most interesting archæological discoveries that has ever been made, and as they relate to what is known as the heroic age in Greece, a period in respect to which we may be said to know nothing, except what is found in the poems of Homer, they are of the deepest interest.

CLEOPATRA'S NEEDLE.

The obelisk known as Cleopatra's needle, although Cleopatra was dead several years before its erection, has, at last, after its many vicissitudes, reached London, but I do not know whether the world is to be congratulated upon its transfer from Egypt to the damp and smoky climate of London. The Column of Luxor, in Paris, is known to be gradually decaying, and the like fate will undoubtedly attend this obelisk, which, in the fine climate of Egypt, has been preserved through so many centuries.

COLUMBUS.

One of the events of the year is the discovery of the remains of Columbus in one of the vaults of the cathedral of the capital of the island of San Domingo.

There was a popular tradition there that Columbus was buried in this cathedral, which was revived by the accidental discovery in one of the vaults or tombs of

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the remains of his descendant, Don I. Luis Columbus, who was Captain-General of the island from 1540 to 1543. In consequence of this discovery, it was resolved to make a careful search to ascertain if there was any foundation for the tradition, and it resulted in the discovery of what is alleged to be the remains of Christopher Columbus, deposited in the chancel of the cathedral. A sepulchre was opened and a lead coffin found with the letter C on it, and an abbreviated inscription which it is declared means "Discoverer of America," and on the inside of the cover was found another inscription in German Gothic letters in these words, "Illtre y Esdo Varon D. Christobal Colon." Within the coffin were found some bones entire, and others pulverized. It will be remembered that what was supposed to be the remains of Columbus were brought in 1795 from San Domingo and re-interred in Havana, on one of the sides of the principal square in that city, where a monument was erected. It is alleged that the Spanish authorities who then removed what they supposed to be the remains of Columbus were designedly misled, and brought away instead the remains of another person. It is said that this was known and communicated afterwards by officials of the cathedral who were privy to the deception, and that it was this information that lay at the foundation of the popular tradition in the island.

My limits will not admit of my entering into an examination of the evidence respecting this discovery, and I can only say that I see nothing improbable in it, nor any reason to question the fact that what has now been found are the mortal remains of the great discoverer.

UNITED STATES.

In giving an account of the geographical work of the year, I shall begin with what has been done in our own country.

COAST SURVEY.

The labors of the Coast Survey during the year has embraced chains of triangulation at different points along the Atlantic coast, and from Cape Florida to the Delta of the Mississippi, with deep sea soundings and observations for temperature on the Gulf of Mexico; the taking of elevations for the determination of the heights of peaks in the Alleghanies and the Blue Ridge Mountains, with labors along the Pacific coast to the Columbia River and in Puget Sound; a detailed account of which labors was kindly furnished to the Society by Mr. J. H. Hilgard, superintendent of the survey.*

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* NOTE.—The following is Mr. Hilgard's statement: "A reference to the progress of the work of the Coast Survey during the past year, may include a sketch of what has been accomplished by thorough organization and energy of management, notwithstanding largely-reduced appropriations; a brief statement of the bearing of its results upon the promotion of geographical knowledge, and some notice of the special scientific problems it has been called upon to investigate or solve.

Following the Atlantic coast, the chain of triangulation has been made continuous from Mount Desert to Cape Canaveral; the interval from that cape to Cape Florida is now being filled; thence from Cape Florida to the Delta of the Mississippi, with the exception of that part of the coast between Cape Table and Cedar Keyes, the triangulation is again complete; between the mouth of the Mississippi and Galveston, a reconnoissance for filling the break in the triangulation has been begun; from Galveston to Corpus Christi the triangulation is unbroken.

As a check system of triangulation, the Maryland and Georgia base lines have been united by a series of triangles of the first order along the Blue Ridge.

In all important localities the topography and hydrography have been pushed

U. S. HYDROGRAPHIC OFFICE.

The Hydrographic Office, under the direction of Captain R. H. Wyman, which supplies the charts of our commercial

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forward. Deep-sea soundings with temperature observations have been taken in the Gulf of Mexico; elevations determined of the peaks of the Alleghanies, and of the spurs of the Blue Ridge in North and South Carolina and Virginia.

On the Pacific coast, where the leading harbors are few, the survey has been advanced on portions of the coast determined partly by the development of commerce; north of Point Conception, above Cape Mendocino, on the coast of Oregon, on the Columbia River, and in Puget Sound.

The opportunity for the occupation of the elevated peaks of the Coast Range, and the extension of the primary triangulation, by observation upon stations in the Sierra Nevadas, has not been lost. Lines from Mt. Diablo and Mt. Helena have thus been observed, one hundred and twenty miles in length, one of the diagonals in the quadrilateral being one hundred and sixty-two miles long.

This work has a special bearing upon the general scheme for the union of the Atlantic and Pacific coast chains of triangles, by systems of trans-continental triangulation, starting from several bases. Having been authorized some five years ago by Congress, on the northern branch the scheme has been perfected to the Ohio River; on the central branch, from a point near St. Louis, the triangulation has been carried westward halfway across Missouri; on the southern branch the work has been executed from Atlanta across Georgia and Alabama, and laid out to the vicinity of Memphis.

These determinations of numerous positions in the interior by astronomical observations, and of elevations by lines of level of extreme position between the two oceans, will furnish accurate data for the State surveys already begun, and it is to be hoped that the present Congress, by wise and timely appropriations, will enable the Coast Survey to continue this interior work, resulting, as it does, in most valuable contributions to our geographical knowledge.

The value of the work of the Coast Survey in the production of clear and expressive charts of the coast, is shown by the constantly increasing demand for these charts, upwards of twenty thousand copies having been distributed during the past year. With the thorough knowledge of the approaches to the coast thus made available, and with the aid of the descriptions and views of the Coast Pilot, must come a gradual diminution of maritime risks.

For all important harbors, frequent re-examinations and surveys are found necessary, notably so for New York, the entrance to which is formed by narrow channels scoured by the ebb current through a cordon of sands. Special surveys have also been in progress the past year at Philadelphia,

marine, and is constantly issuing very valuable publications on the subject of navigation in all parts of the world, has, during the year, in addition to publishing 52 charts, carried on surveys for shoals and other dangers to navigation along our coast, and made deep sea soundings in the Atlantic from the Azores to the Straits of Gibraltar, and has also determined many geographical positions on the north and northeastern coast of South America.

U. S. CORPS OF ENGINEERS.

The geographical work of this great department, under the direction of its distinguished chief, General A. A. Humphreys, which comprises the improvement of harbors and rivers, the survey of rivers and of the great lakes, and geographical and geological explorations in the Territories, is so extensive as to preclude the possibility of a detailed account of it. Conspicuous amongst these labors has been the improvement of the mouth of the Mississippi, to which I have heretofore referred. The southwest pass has now a depth in the channel at high tide of 24 feet, and has proved so advantageous that 254 steamers and sailing vessels have passed through the channel in a month. Capt. C. W. Howell, the engineer officer in charge

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Baltimore, and Beaufort, N. C. Tests of the salinity of the waters of Chesapeake Bay and its estuaries have been prosecuted, as having a bearing upon the study of its general regimen, and upon the important question of oyster culture.

In the course of the work of the survey, a series of magnetic observations has gradually accumulated, giving the means of a thorough discussion of the secular variation of the magnetic declination in the United States. The closing of the chain of fundamental triangles, extending along the southern portion of the Appalachian Mountains, and completing a continuous geodesic arc from Passamaquoddy Bay to Central Georgia, has furnished an important addition to our data for determining the figure and magnitude of the earth."

of the improvement, gives a very interesting account of the causes by which the mouth of the Mississippi has been extended, and by which lakes formerly connected with the river have been enclosed.

An important survey was made for a harbor of refuge on the Pacific Coast, between San Francisco and the Columbia River, there being for a distance of 700 miles N. from San Francisco no safe harbor where vessels can enter in certain stages of the weather. But nine open sea harbors were found in this survey between San Francisco and the Straits of Fucca, all of which were examined, and the preference was given to Trinidad harbor, about 240 nautical miles N. N. W. from San Francisco, in 41° 3′ N. lat., which was found to be the best over the entire distance between San Francisco and Puget Sound. An examination has been made and a detailed survey recommended for a water route for vessels and steamers from the mouth of the St. Mary's River on the Atlantic Coast, through Georgia and Florida, to a point in the Gulf of Mexico, so as to avoid the dangers of the Gulf and of the Florida Straits, by which products can be transported from the whole western country to the Atlantic seaboard; a work which, if practicable, would enable breadstuffs to be carried to Liverpool, and probably to New York, by way of the Mississippi, in unbroken bulk, and at a less expense than by the present route of the northern lakes.

GEOGRAPHICAL EXPLORATION WEST OF 100TH MERIDIAN.

Lieut. Wheeler's Survey.

The geographical explorations in the Territories W. of the 100th meridian, which is a part of the work of this corps, have been continued during the year, as heretofore, under the direction of Lieut. G. M. Wheeler.

The expedition, in two sections, resumed last May the

field-work of the former year in the Colorado and California sections of the survey; and a third division operated in portions of Utah, Idaho and Montana, known as the Utah Section. The work consisted of triangulation, magnetic, geological and meteorological observations, the collection of mammals, birds, reptiles, fishes, insects, shells, rocks and minerals; and the office work consisted in computing astronomical positions, latitudes and longitudes, the barometrical work, the preparation and publication of maps, and the examination of mining localities, especially with a view to the conditions of ventilation and drainage. A profile of the Atlantic and Pacific divide between lat. 35° and lat. 39° 40′ north, accompanies the report.

Ten triangulation stations and fifty-one topographical stations were occupied, and at Colorado Springs a base line over 1,200 feet long was measured. An area twelve and one-half miles long by nine and one-half broad, contains the richest mines of gold and silver of which the world to-day has any knowledge. The Comstock mine, which is east of the summit of the Nevada Mountains, and a little north of Lake Tahoe, is described by Lieut. T. W. Symons, who was in charge of the exploring party, as lying in the midst of piled up masses of volcanic rock of all kinds, where during summer no rain falls; where nothing grows but sage brush, and presents, he says, a scene of grandeur and desolation.

NEVADA AND CALIFORNIA.

Lieut. M. M. Macomb's Survey.

Lieut. M. M. Macomb surveyed Lake Tahoe, which lies in the heart of the Sierra Nevada, 6,202 feet above the sea level, one of the largest fresh water lakes in the West; whilst Mr. A. R. Conkling examined the geology, and Mr. H. W. Henshaw made collections in zoology. The shore line of the lake was found to be in round numbers 70

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miles, and in superficial area 188 miles, two-thirds of which lies in California, and the remainder in Nevada. Mr. Conkling describes the lake as 21 miles long and 12 miles wide; and, unlike many sheets of water, it contains no islands. The shore, however, is diversified by numerous bays, rocky promontories and estuaries. It is, he says, probably the deepest water in the United States, there being only two lakes in Europe that are deeper—Lakes Maggiore and Como. The average depth for ten miles is from 1,200 to 1,410 feet. The shallow water has an emerald green color, and the width of this emerald green zone varies greatly, being in some places nearly half a mile broad, but where the bottom slopes rapidly, it extends only from 100 to 150 feet from the shore line The deep water is of an ultramarine blue color, and its transparency is said to be wonderful, so that a white object can be seen at the depth of 150 feet. The temperature of the lake in November was 50° Fahr. It does not freeze in winter, and it is believed that there is little variation of temperature during the year. During storms, there are waves sometimes four feet in height, and in ordinary weather sufficient motion is imparted to a row-boat to cause sea-sickness. Even in calm weather there is a gentle undulating movement, and during a fresh gale the waves beat upon the shore with almost as much force and noise as on the coasts of the Atlantic. The lake lies between two mountain ranges, known respectively as the eastern and western summits. The western slope of the eastern summit is densely wooded, and is much deeper than the eastern slope. Owing to the large size of the trees, saws had to be used instead of axes in felling them. They are sawed into sections of about five feet long; deep holes are then driven, filled with powder, and they are blasted like rocks.

The Western Summit is the name given to the range bordering Lake Tahoe on the west, which has been explored for the distance of about 35 miles. It rises abruptly from

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the level of the lake to a comparatively narrow serrated ridge line. Some of the peaks are remarkable for the great variety of lichens that grow on the rocky summits. In the southern part, the pine-tree reaches to the height of 150 feet, and the trunks of these trees are often covered with bright green moss to a distance of 30 feet from the ground. The scenery throughout this Western Summit is exceedingly picturesque. The rugged mountains, azure lakes and winding cañons, produce in the landscape a remarkable effect; and whilst the western slope is densely wooded, the eastern is for the most part bare and rocky. The whole country around bears indisputable evidence of great glacial action, being marked by the deepest glacial sculpturings. During glacial times, the trough of Lake Valley was a great *mer-de-glace*, and the smaller glaciers are easily traced. Pyramid Peak, surmounting a ridge, chiefly of granite, has an altitude of 10,003 feet. Tallac Peak is 9,732 feet. Lake Gilmore occupies the bottom of the basin below, with lofty walls, and the eastern slope of Mount Tallac is found grooved and polished by glaciers: five examples of glacial scratches, half a mile from the summit, on the face of the rock, appear as if cut with a chisel. The southern side of this mountain is exceedingly steep, and is nearly covered with rocky debris, with an occasional tree to break the monotony of the scene. The view from the top of the mountain is magnificent, the entire end of the Western Summit being visible on the one side, whilst on the other is the broad expanse of Lake Tahoe, with the Eastern Summit beyond. Twenty mountain lakes were in sight; their mirror-like surfaces reflecting the blue sky, in pleasant contrast to the sombre hues of the densely timbered ridges.

Mr. Conkling says that there is no part of the United States that surpasses in scenery the region about Lake Tahoe. "In my extensive travels in Europe," he says, "I

have seen but one lake that is more picturesque—Lake Luzerne, in Switzerland."

Lieut. Macomb's permanent camp was at Glen Brook, about the middle of the east shore of Lake Tahoe. One of the first objects, he says, which strikes the eye after reaching Glen Brook, is a prominent mass of basalt, which bears the interesting name of Shakespeare's Cliff. A moment's careful inspection, he says, shows an almost vertical escarpment, not far from the summit, formed by a mass of greenish grey lichens, standing plainly out against the dark surface of the rock; a glance at which will, without any stretch of the imagination, transform it into a striking resemblance to the head and bust of Shakespeare, as seen in profile—the high forehead, massive brows and pointed beard being wonderfully reproduced. This interesting object was plainly visible from their camp, a mile to the north of it.

COLORADO AND NEW MEXICO.

Lieut. C. C. Morrison's Exploration.

A party under Lieut. C. C. Morrison, proceeding from Fort Lyon, in Colorado, towards Santa Fé, by the way of Fort Union, surveyed a belt of country south of the Arkansas River, in the vicinity of the Canadian River, and afterwards made surveys more or less extended in New Mexico, and below Santa Fé, in the valley of the Rio Grande, and upon the plateau between that and the Pecos River, as far south as the Forts Craig and Staunton; the party returning by the way of Fort Staunton, through Fort Union to Fort Lyon, the point of departure. South of the Arkansas, for about one hundred miles across the country, is a vast, rolling, treeless, uninteresting prairie, which is adapted for grazing. It abounds in herds of antelope, but has little agricultural land. The whole route

traversed is elaborately described in the report, but embraces too much detail for my limits. The mountains in this part of New Mexico were distinguished, as in the southern part, by the suddenness of their uplift. The ruins of old Spanish towns were passed, and many alkaline lakes. In crossing one of the hills known as Los Animos, rattlesnakes were found in such abundance that three of the party killed seventy-nine in sixty-five minutes.

MONTANA AND WYOMING.

Lieut. E. Maguire's Exploration.

Lieut. E. Maguire gives a detailed report of a march to join the expedition against the hostile Sioux, into the land of the turbulent Dacotahs. He gives an interesting account of the Arickarees, formerly a large and warlike tribe, living upon the Grand River, but now reduced to small numbers by smallpox and other diseases. He describes them as of medium size, and quite dark, presenting at all times a dirty appearance, and looking, he says, when mounted upon horses, not unlike antiquated negro washerwomen. They are sedate, even the young never smiling. They acknowledge the existence of a Supreme Being, but also worship "the Mother," who they believe, on leaving them ages ago, left them an ear of corn as a legacy, and has special charge of them, driving in for them the various kinds of game. They have no established form of worship, but make use of offerings placed on the top of a pole in a prairie, which are held sacred, even by hostile tribes.

Courtship and marriage among them is simply a bargain; the lover giving the father the number of ponies he demands; there is no marriage ceremony, and in taking a wife the husband is entitled to her sisters, who live with him, work for him, and are disposed of in marriage by

him. They have a divorce law of the simplest kind. A man puts away his wife at will. Their chiefs are elective. They have numerous legends and songs, and their language is very crude, containing about 750 words. They can count up to a 1,000, and the word for man is also the word for 20, as corresponding with 10 fingers and 10 toes. They are very brave, gross in their appetites, and have a sort of rude eloquence.

He encountered in the march, fields of a species of primrose, the flowers of which were very beautiful; and as they were crushed under the horses' feet, gave out a delicate and welcome odor.

The Valley of the Big Horn River was found to be more open and extensive than any which had previously been seen, and bore all the evidence of being a fine agricultural country. The descent into this valley was precipitous; and the air was so thick with dust, and had such an effect upon the senses, that it was only when the sharp rattle of the snakes aroused them that there appeared to be any life in the column. There was great scarcity of water. The winter in this region is long—five months of cold weather, the mercury often standing 39° below zero; and another great drawback is the slight rain-fall, which is about eight inches, and confined chiefly to the spring. It is a fine country, however, for grazing, and has a jointed grass which the horses devoured with avidity. The planting of trees had been commenced in Dakota along the line of the Northern Pacific Railroad, and so far has been successful.

The summary that Lieut. Maguire gives is, that the valleys of the Yellow Stone, Big Horn, Little Horn and Tongo River, are fair; but those of the Rosebud, Powder, Little Mazoura and Tolick's Fork, so far as traversed, are worthless, and fit only for the venomous snakes that abound there.

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Lieut. E. J. McClernand's Expedition on the Yellow Stone River.

A portion of the same region was passed by the forces under Col. J. Gibbon, commanding the expedition down the Yellow Stone, an account of which is given in the Report by Lieut. E. J. McClernand. He describes Crazy Mountain, which is detached from the main range and stands alone, at a height of 10,000 feet, as a rallying point for the clouds, great masses of which hover around the tops of its lofty peaks, while thousands of springs trickle down its rugged sides, and are the sources of numerous streams. He describes the country around Pompey's Pillar as very beautiful; the valley itself being one of the finest to be seen along the Yellow Stone River, extending for miles along the river, and varying in width from one to six miles, with about 70,000 acres of arable land, lying favorably for irrigation; a valley which, he says, will have a bright future.

The country in the region of the Big Horn Mountains is described as a fine grazing region of hills and valleys, covered everywhere with a mass of the most nutritious grasses, with numerous streams, fed by the melting snows of the Big Horn Mountains.

Gen. Brisbin's Account of Powder River Country.

Gen. Brisbin has given an interesting account of the large area known as the Powder River country, extending from the sources of the Big Horn and Powder Rivers over the Big Horn Mountains and the plains, as far as the Missouri River, a country unknown, except as an Indian hunting ground, until 1866. He describes the Powder River country as possessing all the elements of wealth—a fine soil, a good climate, coal and iron in abundance—and as destined, at no very distant day, to be the home of a large population. Game is more abundant there than in any

part of the United States. The buffalo ranges in herds of thousands, sometimes blackening the country for miles, and the elk is often seen in herds of 500 at a time. It contains one of the greatest natural curiosities of our continent—the Big Horn cañon, which rivals the famous gorge of the Colorado.

E. D. Bilson's Journey up the Big and Little Horn Rivers.

Sergeant E. D. Bilson, U.S.E., made a journey up the Big Horn and Little Horn Rivers for 66 miles, to obtain information respecting the nature of these streams and the adjacent country. He found up the Big Horn as far as he went, his further progress having been impeded by rapids, a most fertile country, elk abounding in the grassy islands along the river. His return down the Little Horn was so rapid, from the force of the current, that the stern of the boat led the way, and his descent, he says, was accomplished in a manner that was a novelty in navigation—by a continual whirling and revolving of the boat.

DEPARTMENT OF THE PLATTE.

Survey of Capt. W. S. Stanton.

There has been a survey in the Department of the Platte by Capt. W. S. Stanton, for a revised military map, aggregating between 500 and 600 miles. The labors of the Department have embraced telegraphic determinations of longitudes and meteorological observations. During the early part of the year field notes and astronomical observations were taken, and the reconnoissance of the previous year of 900 miles was reduced and computed.

DEPARTMENT OF THE MISSOURI.

Lieut. E. H. Ruffner's Account of the Staked Plains.

In the Department of the Missouri, surveys were made of the head waters of the Red River in Texas, which was found to be a good grazing country. Lieut. E. H. Ruffner gives an eloquent description of that large space on the map of Texas called "The Staked Plains," and of the main cañon of the Red River, which he describes as a gorgeous sight, the walls of this cañon being cliffs of brilliant sandstone, capped by white limestone. In the course of it, lower down, the stone is washed and twisted until it becomes a marvel of intricacy, and is at the same time so dazzling from its brilliancy as to convert the whole into a wild and enchanting scene. The colors were so vivid that no tints in the drawing could reproduce them.

THE UNITED STATES GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES.

Prof. F. V. Hayden's Survey.

The geological and geographical survey of the Territories, under the direction of Prof. F. V. Hayden, having completed the survey of Colorado in the summer ot 1876, transferred their labors to Wyoming and Utah Territories in June, 1877. The district in which they have been engaged during the past year lies between the 107th and the 112th meridians; that is, between Ogden and Fort Steel, and is bounded on the south by the Union Pacific Railroad. From there the survey extended northward to the parallel of 44° 15′ N. latitude, the area covered being about 30,000 square miles. Three topographical and geological parties were employed under Messrs. Gannett, Chittenden and Bechler. The basis of their work was a general triangulation carried over the whole region by Mr. A. D. Wilson, Chief Topographer of the survey.

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The physical features of this part of Wyoming and Utah are very interesting, comprising as it does some of the finest ranges of the Rocky Mountain chain, especially the Wind River Mountains and the Teten group, whose peaks rise over 13,000 feet in height. Mr. Wilson, who has carried on explorations in nearly all parts of the Cordilleras of the United States, says that he knows of no range having such accumulated masses of snow as the Wind River Mountains.

The higher peaks of the Rocky Mountains in this northern part are granitic, but along the western side of the chain, outflows of lava have taken place on a scale hardly equaled elsewhere in the United States. Large sections of Idaho Territory are covered with sheets of basalt that have poured out of fissures in very recent geological times.

The other scientific branches of the survey were represented by the very distinguished men who accompanied Prof. Hayden—Sir Joseph D. Hooker, President of the Royal Society of London, and Prof. Asa Gray, of Boston Harvard College.

Major J. W. Powell's Survey of the Rocky Mountain Region.

Prof. J. H. Thompson carried his triangulation over a broad area, west of the Green River, of about 16,000 square miles, connecting it on the east with the work of Dr. Hayden, and on the north with that of Clarence King. The triangulation work of Mr. W. H. Graves embraced an area of about 10,000 square miles east of the Green and Colorado Rivers. In this area a bold escarpment, facing the south, extends far from the western, and beyond the eastern limit of Mr. Graves's work, which is known as the Book Cliffs. At the foot of this lies a narrow valley, through which passes the only practicable route of travel between Central Utah and Western Colorado, and south of this valley the whole region is cut by a labyrinth of cañons formed by the

Grand and the Green and the St. Rafael rivers and their tributaries, and is one of the most inhospitable and inaccessible regions of the Territories of the United States. It is characterized by extreme aridity, bold cliffs, towering mountains, hills of drifting and glittering sands, and deep, tortuous cañons, which give the landscape a strange and weird appearance.

Mr. J. H. Renshawe's work embraced an area west of that of Mr. Graves, of 6,000 square miles, the eastern part of which is a broad plateau, with but little irrigable land, cut by deep valleys; and the western part, which has broad valleys, abrupt ranges of mountains, and one plateau of considerable extent, embraces a large area of excellent lands, and numerous streams with a good supply of water.

There has also been, in addition to the topographic labors in the field in this survey, a large amount of ethnographic work relating to the Indian tribes, their distribution, languages, customs and archæological remains, and geological studies by Capt. C. E. Dutton and Mr. G. K. Gilbert.

SURVEY OF THE STATE OF NEW YORK.

Two years ago this Society appointed a committee to examine and report upon the necessity, objects and proper character of a survey of the State of New York, as the maps at present in use were found wholly unreliable, being based on a patchwork of local surveys made with the compass and rough chains, nearly one hundred years ago.

The Society then appointed a committee to present these facts to the State Government, and to urge the necessity of an accurate triangulation of its territory. In pursuance of these recommendations, an Act was passed and an appropriation of $20,000 was voted for beginning the work. The General Secretary of the Society, Mr. Jas. T. Gardner, was appointed Director, and the work has now been in progress two years under his charge.

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The triangulation has been carried through the eastern central part of the State, extending from the Hudson River to Utica, over an area of about 3,000 square miles, including parts of eleven counties. The work is of the highest order of accuracy, the horizontal angles being measured with a twelve-inch circle, reading to tenths of seconds by means of three microscopes. Every city, village and hamlet is thus located with absolute precision. A map has just been published, accompanying the report of Director Gardner. A comparison of this with the former maps shows that on the old map of this part of the State, the cities and villages are often misplaced more than a mile. The survey has not found a single town where it was represented to be on the old maps. During the coming season, the triangulation will be extended across the entire State.

CENTRAL AMERICA.

INTER-OCEANIC SHIP CANAL.

Lieut. Wyse, of the French Navy, who conducted the expedition for ascertaining a route for a canal across the Isthmus of Darien, completed his reconnoissance during the year and has published his preliminary report. His conclusion is that no navigable channel is possible between the Tuyra and the Otrato without locks or tunnelling. The water parting, he finds, sinks in the Col du Thulé to 480 feet. He recommends the route from Chucumaque to Gandi Bright, west of the outlet of the Gulf of Uraba or Darien, and he is to make further investigation this winter. M. de Puydt's plan for the canal is to start on the Atlantic side from Puerto Escandido, about 140 miles south of Panama, following the river Turgandi, to the valley of Tanela, thence across the Cordillera range through the defile between Mali and Estola peaks, at a height of 45 metres above the

sea level, and continue thence by the valley of the River Puero to the Pacific side. The canal he recommends is one to be constructed without locks, the water of the higher region being collected at a fixed point of elevation, and allowed to flow down by gentle declivities toward the Atlantic and the Pacific.

DR. A. LE PLONGEON'S DISCOVERIES IN YUCATAN.

Dr. A. Le Plongeon has been engaged for some time in researches in Yucatan among the ruins of Chichen Itza, Uximal, and Aké, and those of the once famous islands of Azumel and Mugeres, and has made many interesting discoveries. He has taken many valuable photographic views of ruins, structures, and hieroglyphics, and discovered a remarkable statue which was buried 21 feet in the ground. It is a large recumbent figure, nine feet in length, placed upon a slab, with the knees drawn up, and the head slightly averted, with a menacing aspect and a very striking expression. Except the covering of the head, it is a nude figure, carved out of a single block of beautiful limestone. Dr. Le Plongeon says that it is the statue of Chac-Mool, whose figure is represented in other parts of the ruins, in battles and in council. The Doctor says that, by means of the alphabet preserved in the manuscript by Bishop Landa, who was Bishop of Yucatan in 1573, he has obtained a clue to the hieroglyphics on the Yucatan ruins, and is able to decipher them. That he deciphered on the southeast wall of what Stephens calls the Gymnasium, a statement that the statue of Chac-Mool lay buried 400 feet from the monument which the Queen of Itz had raised to the memory of her husband Chac-Mool. That he excavated in that direction, and at the depth of 21 feet discovered the statue, with a stone urn near the head of it containing a little dust. He succeeded by means of an ingenious mechanical apparatus in raising this large figure; and it was his inten-

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tion to have removed it to this country, which he undertook to do, but was prevented by the Yucatan authorities, who placed it as a public monument to ornament the square in the chief town of Yucatan. The Doctor also discovered some other figures in the Island of Mujeres, and he thinks, as the result of his researches, that relations formerly existed between the people of Yucatan and the inhabitants of the island on the west coast of Africa, as he finds many things resembling the Guanches, the early inhabitants of the Canary Islands, whose mummies are yet found in the caves of Teneriffe and in other islands of the group. It has been maintained by Kennedy and others, that as the remarkable ruins in Central America are situated either on or near the sea coast, or at or near the mouths of navigable rivers, it warrants the presumption that the places where they exist were founded by a maritime people, and being situated on the eastern coast, that the founders came from the west, across the Atlantic; that the use of paved roads, the winged globe, the serpent symbol, the hawk-headed divinities, the dresses of the figures on the monuments, the pottery and its ornaments, the gorgon-like images with protruding tongues, the collossal statues, the sacrificial altars and the general religious rites, as far as indicated; all point to an eastern origin, and that the remarkable civilization of Yucatan indicates a communication with strangers of Phœnician or a kindred race; that these facts, in connection with many statements found in ancient authors, and the traditions of the people themselves that they received from strangers and their knowledge of the arts, renders it probable that voyages were made in ancient times across the Atlantic to this part of Central America by Phœnicians or Carthageans, or both, who had a tolerably accurate knowledge of the country, but which, from their jealous commercial policy, they kept as far as possible to themselves; a theory which Dr. Le Plongeon's discoveries, so far as he has indicated them, would seem to confirm.

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SOUTH AMERICA.

PERU.

An earthquake with an accompanying inundating wave, spread desolation along the coast of Peru, on the 9th of last May, and was in its effects one of the most destructive on record. The tidal wave of this earthquake reached Tailohae Bay in Nukahiva, one of the Marquesas Islands, in about 140° W. long. The loss of life is put at 600 souls, and the destruction of property has been estimated at twenty million dollars.

Major D. A. Rivira and M. A. Wertheman have explored the rivers Perenè and Tambo, tributaries of the Ucayali, in the Peruvian Mountains, with the view of ascertaining whether any communication is possible between the Perenè, the Amazon and the Tambo, in the valley of the slope of the Andes from Lima. Their examination was of great importance, to ascertain whether a railway from Lima, if extended, could form a highway of rail and water communication from the Pacific to the Atlantic through the Amazon, and the report of the explorers upon this important question is a favorable one. M. Wertheman is of opinion that the transit from the Pacific Coast to the Amazon could be made in eight days, and his account of the survey embraces full information respecting the rivers and the climate of the valley, as well as an interesting account of the Chuncho or Campas Indians, who are still in a state of barbarism; all communication with them having ceased since 1742, when they put to death all the missionaries and Spaniards in their vicinity.

BOLIVIA.

M. Weiner, during the year, made the ascent of Mount Illemánia, one of, if not the highest of mountain peaks of the

Bolivian Andes. Its height has been taken several times with different results. In 1877 Mr. Murchin measured it trigonometrically from beneath, and found it to be 21,224 feet. If this measurement should be correct, M. Weiner has not only made the highest ascent in the Andes, but the highest upon the earth's surface out of Asia. Glashier, in his memorable ascent in his balloon, in 1862, shot up in less than an hour to the remarkable height of 30,000 feet; and Mr. Johnson reached, in Cashmere, to 22,300 feet. From the result of recent observations it would seem that Aconcagua is the highest peak of the Andes, the lowest estimate of which is 23,200 feet, but it is probably higher. M. Weiner in his ascent of Mount Illemánia came to the line of perpetual snow at 14,027 feet. Shortly after, he had to abandon his animals and ascend on foot, with the aid of the alpenstock and the assistance of ropes. After nine hours of arduous climbing he reached the summit, and left a confirmation of his ascent hermetically sealed up in a glass tube. It has generally been the effect in ascending great mountain heights that, beyond a certain point, respiration becomes difficult, and the pressure has been found to be so great in some instances that the blood started from the mouth and nostrils; but what was remarkable in this ascent to so great a height was that respiration was easy, and none of the disagreeable effects which usually attend such ascents were experienced. M. Weiner attributes this to a continued upward current of air from the land below, in consequence of the peculiar configuration of the mountain, which current surrounded his party and continually gave them an atmosphere in which they were able to breathe freely. Whether any one can ascend to the highest point upon the earth's surface, the summit of Mount Everest, in the Himalayas, which is 29,002 feet high, is one of those problems to be determined when such an attempt is made.

PATAGONIA.

Sig. F. P. Moreno, to whose researches I have heretofore called attention, has been engaged in exploring a part of Patagonia but little known.

He ascended the river Santa Cruz, which flows into the Atlantic, and after a month's labor reached the lake in which that river takes its rise, 50° 14′ 22″ S. lat., 71° 59′ W. long., crossing the lake in the first boat that had ever floated upon its waters. He found the lake to be thirty miles in length from east to west, ten miles broad, and also very deep, no bottom being reached at 120 feet. He then journeyed northward on horseback, over mountains 3,000 feet high, and discovered another large lake in 49° 12′ S. lat., which was surrounded by woody and snow-capped mountains, and which was connected with a still larger lake in the hollow of the Cordillera, which he has called St. Martin.

Upon his return, he reached the lake discovered by De Viedma in 1782, which is probably the largest lake in Patagonia. A river which DeViedma erroneously supposed to be the Santa Cruz, he (Moreno) found connected Viedma's lake with the one that is the source of the Santa Cruz, and he named this connecting river, which is twenty-four miles in length, the Leona. He makes the important statement that the Santa Cruz, he thinks, could be navigated by steamers drawing 12 feet of water, from the Atlantic to the base of the Andes.

ARCTIC.

CAPTAIN WIGGINS' VOYAGE TO THE KARA SEA.

Explorations in the Arctic have been carried on during the year, but they have been of a limited nature compared with those of preceding years. Capt. Wiggins, to whose explorations I have previously referred, made a voyage

in a steamer through the Kara Sea. He surveyed the Bardarota Gulf, and found there a commodious harbor, and by his examination of the temperature of it, he demonstrated that the equatorial current flows into the Kara Sea. He proceeded to the Gulf of Obi, but was prevented by strong winds and currents from ascending the Obi River as he had intended. He then sailed for the river Yenisei, discovering on the route many magnificent islands, covered with verdure, abounding in reindeer, and with natural harbors of the most extensive kind. On the shores of most of these islands driftwood was piled up in immense heaps, containing trees which would make masts for the largest man-of-war, and which were as sound as when lodged there, through the preserving power of the climate, and many, he thinks, have been lying there for centuries. He ascended the Yenisei with his vessel to the mouth of the river Kureika, which is a little south of the Polar Circle, and, leaving his vessel there, he went by sledges to Yeniseisk, which is a fine town of 11,000 inhabitants, and passed through magnificent forests with trees of immense size. From Yeniseisk he found his way to St. Petersburgh.

A Russian society has fitted out an expedition for the maritime exploration of the Gulf of Obi, and a M. Sibireakov is, at his own expense, to undertake the exploration of the Angara River, to ascertain what may be required to navigate it. This liberal patron of geographical exploration has also offered to expend a large sum, under the direction of the Russian Geographical Society, to ascertain the possibility of uniting by canal the rivers Obi and Yenisei and the Sena Angara, which, if practicable, will give a communication by water from the northwestern frontier of China across the whole of Siberia, nearly to the boundaries of European Russia.

Lt. Onatsevitch, of the Russian navy, who was engaged in geographical work in Eastern Siberia and the Sea of

Okhotsk, made an attempt to reach Wrangel's Land from Behring's Straits. Beyond East Cape, however, in 67° N. lat., he met with an impenetrable barrier of ice, and was compelled to take a westerly course, but in this direction his further passage was obstructed by ice, and he was compelled to return. He made, however, very valuable measurements of the depth and temperature of the water, and, what is important, he noticed a warm current which, after running through Behring's Straits, takes a westerly direction, and which I infer must be a continuation of the Kuro Siwo, or warm current, that runs along the coast of Japan.

M. Kelsief has been engaged during the year in researches along the coast of Lapland and the White Sea, making researches chiefly of an ethnological character.

SIR JOHN FRANKLIN'S EXPEDITION.

It will be remembered that in 1872 Captain Edward Potter, the master of a New Bedford whaler, whilst wintering in Repulse Bay, obtained a few spoons and other relics of the ill-fated expedition of Sir John Franklin, from two Esquimaux of the Netchelli tribe, who told him that the articles had belonged, with other effects, to a party of white men who came a long time before to the place, in the Gulf of Boothia, where the Netchelli were then wintering, and all of whom they said had died there during the winter from exhaustion and want of food. This information, which seemed to indicate the fate of the last members of the expedition, did not at the time attract much attention, it appearing improbable that the survivors had gone in the northeastern direction to which this information pointed, when it appeared from their own record, found by Sir Leopold McClintock at Point Victory, on the northwest coast of King William's Island, that they were compelled to abandon their ships and were to start on April 26, 1848, from that point, 105 souls, under the command of Captain Crozier, Sir John Franklin

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being then dead, for Back's Great Fish River to the south; and that they did so was confirmed by the information received afterwards by Dr. Ray from Esquimaux, that a large party of white men had been seen traveling southward from that point on their way to the great Fish River, and that in the following spring, the natives who had seen them, saw the bodies of five or more white men lying scattered about, close to the water's edge, on a low flat part of the coast, which Dr. Ray supposed to be in the vicinity of Point Ogle. As they would naturally go in this direction to reach the forts or trading posts of the Hudson's Bay Company at the southwest, the nearest point where they could expect to find a settlement of civilized men, it appeared highly improbable that remains of any of them should be found in a far different direction to the northeast, in the lower part of the Gulf of Boothia.

During the present year, however, Thomas F. Barry, the second mate of the *A. Houghton*, a whaling vessel which was stranded last year on the northeastern shore of Hudson's Bay, and who was with Captain Potter in 1872, when this information was received from the Netchelli Esquimaux, brought back the intelligence that whilst his vessel, the *A. Houghton*, was wintering last year at Marble Island, in the upper part of Hudson's Bay, he obtained from some other Netchelli Esquimaux who were then there, a silver table-spoon with Franklin's crest on it, which he has brought back with him, and that upon conversing with these Netchelli they told him exactly the same story respecting the party of white men that he had heard from the other Netchelli when at Repulse Bay five years before. This corroboration led me to inquire of Messrs. Morrison & Brown, the shipping merchants of this city, for Barry, who very politely brought him to my house, and I had a long, full and very satisfactory conversation with him. Barry learned to speak Esquimaux when wintering at the head of Hudson's Bay in 1864, he being then 22 years of age, and as

he has passed three winters since in the same region and has had much intercourse with the people, he speaks it very well, which I am able to state upon the authority of our old Esquimaux acquaintance of Hall's expedition, Joe Ebberbing, who is with us here to-night, and who has frequently conversed with Barry. I think, therefore, that it may be assumed that he understood the natives with whom he spoke, and that they understood him; and I may add that throughout the whole of my interview with Barry, I was thoroughly satisfied of his truthfulness. I have been thus particular, as Sir Leopold McClintock has intimated, in a recent communication to the British Admiralty, that Barry has probably that mere smattering of the language which whaling seamen usually acquire, and which compels them to put leading questions, giving rise to such mistakes and confusion as to render any information so derived of comparatively little value. I will give Barry's account as briefly as I can express it. When he was with Capt. Potter in Repulse Bay in 1872, the Esquimaux built their snow huts close to the vessel, and remained there during the winter. Among them were two families of the Netchelli tribe, from whom Capt. Potter obtained the Franklin relics before referred to. One evening, in the cabin of the vessel, whilst the Esquimaux were sitting round and Barry was making some entries in his journal, he heard one of the Netchelli remark that the book in which Barry was writing, was like one which the white men had who had been amongst them. Upon this, Barry and Capt. Potter, who also spoke Esquimaux, inquired respecting the white men to whom they referred, and the two Netchelli told them that a long time before—or, as they expressed it, many winters past—a party of white men came to where their tribe was then wintering, all of whom died of cold and hunger, the winter being very severe, as there was no game or seals, and the Esquimaux themselves had nothing to subsist on but the skins of seals and other animals. That

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these white men had a Hitato, which, in Esquimaux, means a leader or father, who was a stout man, and wore a coat with three stripes of some kind on the lower part of the sleeve, and who gave directions to the others, as Capt. Potter did on board the vessel; that when the spring came and the ice broke up, the white men were all dead; that they died one after the other; those who remained burying the one who died by wrapping up the body in a kepick, which is the skin blanket with which the Esquimaux cover themselves in sleeping, and laid the body upon a rock near by, covering it over with stones to keep it from the wolves and bears; and that the last who died the Netchelli buried in the same way and in the same place. That after a good many had died, the rest made a kitch—the Esquimaux word for cache or cairn—and put under it something like the book in which Barry was writing, which was then lying open upon the table, and which the Netchelli examined.

These Netchelli had never seen a white man before nor since, until they came to Capt. Potter's vessel. A chart was laid open before them, and the position of Repulse Bay being shown them, as a starting point, they were asked if they could point out where these white men died and were buried. It may here be mentioned that the Esquimaux are remarkable for the accuracy with which they can trace the outlines of the coasts with which they are familiar upon a chart. The two Netchellis followed up very carefully the western outline of Melville Peninsula until they came to Cape Englefield, the northwest point of that peninsula, when they looked for an island in the west, in the Gulf of Boothia, and were disappointed at not finding it on the chart. As Barry understood them, it was upon this island, or in its vicinity, where the white men were buried, and they gave the direction of the place by pointing to the northwest from Cape Englefield. The Esquimaux Joe Ebberbing tells me that he saw this island when he was

with Hall, and he fixes it upon the chart at about 70° N. lat. and 87° W. long., in the Gulf of Boothia.

The Netchelli which Barry met with last winter gave substantially the same account as the others, with some additional particulars which are not very material, and two of them, who were between 50 and 60 years of age, said they had seen these white men. The Netchelli offered to go and point out the spot where the cairn they said still remains, with the books or papers that were put under it; but it involved a journey of over 400 miles, and those in the vessel were not provided with the equipment necessary for such an expedition.

This information is of a very interesting character. There is, of course, the difficulty that when last heard from, the parties under Captain Crozier were going south, in the direction of the Great Fish River, and the question arises why they should afterwards change their course and go in a northeasterly direction. Still, there is the probability that they, or some of them, may have done so. They knew that there was a large depot of provisions at Victory Harbor, on the southeastern shore of Boothia Felix, where Sir John Ross abandoned his vessel, the *Victoria*, in 1832, and which place, it may be remarked, is in the vicinity of the island where, according to Barry's information, the party of white men died and were buried; the position of this island, as indicated by Joe, being about 200 geographical miles a little to the southeast of this depot of provisions. Joe, when with Hall, heard from the Netchelli tribe, whom they met near Ingles Bay, east of King William's Island, that these natives saw a party of white men dragging two boats on sledges in the direction of the Great Fish River, many of whom had bad mouths and bleeding lips, which would indicate the breaking out of scurvy. This may have compelled them to abandon their attempt to reach the Hudson Bay's settlements, and to go from there to Victoria Harbor, where Sir George Ross had passed two

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winters, and where they knew that provisions would be found; or their attempt to get south may have been obstructed by the hostile Indians, who hunt up the Fish River as far as Lake Macdougal, who are known to have killed white explorers, and who are the dread of all the Esquimaux who live north of that river.

When Sir Leopold McClintock found a boat with two skeletons in it, he was astonished to find that the sledge on which the boat was placed pointed to the northeast, and this circumstance and what he found in the boat, led him to think that a detachment from the main body that had gone south, afterwards left it to return to the abandoned ships; that they were unable to drag the boat any further, and that the two men whose skeletons were found in her were left there by their companions, with such provisions as could be spared, until the return of the others from the ship with fresh stock. He concluded that it was their intention to return to the boat, from the many valuable things that were found in her, but that this party had not returned. His conjecture may be right, and it is possible that it was this party that reached the winter settlement of the Netchelli, although, if they were in pursuit of food and a place of winter refuge, it might naturally be supposed that they would have kept on their way around the eastern shores of Boothia Felix to Fury Beach, in Prince Regent's Inlet, where the *Fury* was abandoned, and where they knew there was also a large depot of provisions, which Captain Markham, R.N., when he visited Fury Beach in a Dundee whaler, found there. But whatever conjectures may be indulged in, I think there is sufficient in the information communicated to Captain Potter to justify a search for the spot where the Netchelli say this party of white men died, and where they say their graves still remain and the cairn they erected, which could be easily done at a comparatively small expense. Apart from the interest that is felt in knowing the final fate of the officers and crews of

this large expedition, there is the expectation that where the last of them perished some record will be found, and which will be of scientific value if it should contain the observations made over this part of the Arctic in the expedition. The record of his journey is the very last thing that an explorer will part with. Everything will be sacrificed for its preservation, and the assurance may be felt that some memorial containing documents and papers, the precious record of their labors and their fate, was erected in the vicinity of the place where the last of them died, in the hope that at some future time it would be found by civilized man.

ASIA.

PALESTINE.

Lieut. Kitchner, R. E., has announced that the survey of Western Palestine, which was begun in June, 1875, has been completed. It appears, from the survey, that the Sea of Galilee is 682 feet below the Mediterranean; that the Dead Sea is 1,292 feet below it; that between these two seas there was a fall of a little over 600 feet, and that the deepest part of the Jordan valley is about 1,300 feet below the level of the Mediterranean.

The enormous quantity of water brought into the Dead Sea by the River Jordan is carried off by means of evaporation, which, in this latitude, says Major Wilson, is something enormous—the evaporation, he says, compensating for the supply—and well defined tide-marks were found, when the sea was examined, at different periods of the year, the highest periods being when the rains fall and the Lebanon snows melt.

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TRANS–CAUCASIA.

Mr. T. Gardner, from the banks of the River Rion, the ancient Phasis, in Asiatic Russia, penetrated into the unknown regions of the Abkassian forests of Trans-Caucasia, and found the climate on the high land good, and the scenery grand and imposing.

PERSIA.

Capt. McGregor and Capt. Lockwood have been employed in explorations in Eastern Persia, and have gathered valuable information in regard to the mountain ranges, rivers and lakes in that part of Persia.

Mr. E. Floyer, F.R.G.S., was engaged in an expedition through Mekran, Bashakard, Persia, Kurdistan, and part of Asiatic Turkey. He penetrated with difficulty to Anguhran, the capital of Bashakard, a mountainous country, previously unexplored.

TURKESTAN.

The Alai and Trans-Alai-Range.

In Southeastern Turkestan, or in the south of what is known, upon the map, as Khokland, there is a mountain region known by the respective names of the Alai and Trans-Alai ranges and the Pamir plateau, at the southwest end of which lies Samarkand, the city so famous in the days of Timur, and now containing the tomb of that great conqueror. Beyond the Panmir to the east, in Eastern Turkestan, is the great trading city of Kashgar, which was a place of commercial importance before the commencement of the Christian era. This mountain region is of interest, not only from its geographical relation to the great mountain system of Central Asia, but because there is reason to believe, from a passage in Ptolemy, that it was in and

before his time the route for commercial intercourse between China and the western world, and it is still the best route from east to west through Central Asia. It has, however, for many centuries been under the dominion of fanatic Mussulmen—tribes who have shut it off from all intercourse with civilized nations; and has hitherto been so imperfectly known that even the very name of these important mountain ranges is not to be found upon general maps published ten years ago. The conquests of the Russians, however, have opened up this part of Central Asia, the seat in the 14th century of civilization, and of international intercourse from different parts of Asia and Europe in the days of Timur or Tamerlane; and it is to English and Russian travelers within the past few years that we are indebted for what we now know respecting that region, although it is still very imperfectly known. A Russian military expedition was despatched to the chain of mountains south of Khokand, to reduce certain tribes to obedience, with which was connected a geographical and scientific corps, one of the members of which, Col. Kostensko, has given a very interesting account of the geographical information he gathered.

They entered the mountain ranges through the gorge of Gulsha, a river that runs with fearful speed and tumultuous noise, along banks heavily lined with woods, requiring steady nerves to traverse the narrow pathways and steep precipices, over great abysses and torrents, in ascending the mountain sides. They crossed with great difficulty the Alai steppe to the base of the Trans-Alai; and after another range was passed, obtained from the highest point reached a magnificent view of the Pamir, with Lake Karakoul, and the lofty range of the Trans-Alai, in the distance. They reached Lake Karakoul, which is covered with islands, lying in a deep basin enclosed by mountains over 11,000 feet high, most of which are glaciers. Col. Kostensko traversed two-thirds of the lake, which, he says, has no outlet. He also ascended with great

difficulty one of the highest hills on the island, and the panorama before him he describes as magnificent, the glaciers being reflected in the blue waters of the lake. The lake, he thinks, is the extinct crater of a great volcano now filled with water from the icy mountains surrounding it.

At this altitude of 11,000 feet, he was told by the natives that rain was very rare, and fell only in the form of hail. His attention was called to the curious fact that a tide rises in this lake, or more properly a rise takes place in its level, regularly once a week, and generally upon Friday; and he saw it rising on Thursday evening, and the following morning, by watching one of the affluents, which was twice as high as on the other days of the week—a phenomenon of which no explanation could be given.

He was nine days in the Pamir plateau, and examined it for a distance of about 75 miles. The northern limit of it, which is the Trans-Alai range, has, he says, the appearance of Alpine mountains; that the country is sterile, except beside the water-courses; that the roads through the Pamir are tolerably easy; but that the climate is very rigorous, violent winds prevailing, with a rarified atmosphere, making it difficult to breathe.

This exploration has settled an important fact in Asiatic geography—the existence of a chain of mountains running north and south—which Humboldt called the Bolor mountains, but the existence of which has heretofore been questioned.

Capt. Kuropatkin made a journey from Ush, in Ferghana, to Kashgar, and gathered some valuable information in respect to the passes of the Thian-shan. The Russian embassy sent last spring to Kurl, has made a complete survey of its route, Capt. Kuropat exploring Lake Bastan-Nor, and the route to Karasha east of Kurl, and Lieut. Senorguroff the route from Aksu to Karakol, following the Babel pass.

M. C. De Ujfelby made a journey from Samarkand to Penjakend, and thence to Urmitan and the environs of Varsiminor, along the right bank of the Zarafshan, afterwards returning by the left bank, with a special reference to studying the Galtchas, an aboriginal people of Iranian origin, who are almost pure in type in their highland fastnesses. He afterwards visited Kohjend, Kokan, and Gulsha, at the foot of the Terek pass, and then by the valley of the Ali made an excursion into the Pamir.

Col. Prejavalsky's Exploration of Lake Lobnor.

Col. Prejavalsky, to whose previous geographical labors in China and Mongolia I have heretofore referred, was sent out by the Geographical Society of Russia for the exploration of Lake Lobnor, and for explorations in Thibet, in that vast plateau so little known between Siberia, the Himalayas, China, and Turkestan.

He went from Kulja, in Russian Zungaria, by the valleys of the Tekis and Yuldus to Kurla, crossing a pass of the Thian Shan; and from thence, after some delay, he passed on to the south, and reached Lake Lobnor, being the first civilized traveler who has visited this lake since Marco Polo. He found the topography of the lake valley and the surrounding region very different from what it is represented upon the map. He circumnavigated two-thirds of the lake in a boat, and discovered a mountain range called the Allyn Tan, rising to a height of 10,000 feet; and afterward, whilst in these mountains, shot several wild camels. Wild camels are mentioned by Herodotus, but their existence has been doubted by many naturalists; and we have, in this fact, another verification of the reliability of the old Greek historian.

In the neighborhood of Lake Lobnor he found the ruins of two old cities, and 120 miles south of the lake noted the Tarrim River. He has since started for Thibet by a more

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southern route, finding it impossible to reach it from Lake Lobnor, but was taken ill; and, when last heard from, was at Zaisan.

The results of Col. Prejavalsky's explorations, in addition to what has been stated, are: a survey from Kulja, for 800 miles into the interior; seven determinations of latitudes and longitudes, many barometrical measurements of heights, and rich botanical and zoological collections.

THIBET.

The Abbé Desgobins, a missionary at Yerkalo, has acquired a great deal of information respecting the obscure geography of the region between India and China, especially in respect to the mountain ranges and their connections. The mountainous character of Thibet he likens to a large sheet of crumpled paper laid on the table. One of his conclusions is, that the Bramaputra and Irawadi are not, as he had previously supposed, the same river.

MONGOLIA.

G. A. Potanin's Journey.

Mr. G. A. Potanin was sent by the Russian Geographical Society to explore the northeastern portion of Mongolia south of Tunisk and of the Yenisei River, which is much less known than other parts of Central Asia. He proceeded first to the Djamata Pass of the Black Irtish in Eastern Mongolia, reaching the banks of the Kram at Tulta, and undertook the ascent of the Altai; but the further progress of the expedition was stopped by the masses of snow that accumulate in winter in the passes south of the Djabgan River, and they had to take the easier southern route of Urmogaita on the Upper Kram, and crossing the Tere, and then the Klasu Pass, which is 10,000 feet high, they reached the town of Khobdo. He afterward started for Hami, crossing the eastern part of the Altai mountains to the Gobi

steppe, to the Chinese town of Santaru. He then crossed the Mechin-Ola chain, which runs parallel to the Thian-Shan, and reached Hami last May, where he was very kindly received. One of the important results of this expedition will be a map of his route from Zaisan to Khobdo. When last heard from, he was about to explore the almost unknown tracts at the sources of the Yenisei in Northern Mongolia.

Capt. Pevtsow has made a journey across Western Mongolia, from Zaisan through Dzungaria to Guchen, in which he ascertained the elevation of 15 summits of the Thian-Shan, the level of the snow line; and made a very complete series of observations over a distance of nearly 600 miles, the value of which will be enhanced by a map which he is preparing of his route.

CHINA.

The Rev. A. W. Nightingale made a journey up the river Han in China to Siang-Wang Fu, an important town above Hankow. About half way up he found that the river, after being very narrow, widened out in many places two miles broad, and it must, he says, in summer be a noble stream, upon which the largest steamers could run. He found only two large towns near the river, on the upper part of his journey. On the left bank of the Han he visited Fan-Tsing, one of the chief commercial marts of the Chinese empire, to which travelers and merchants flock from all parts of Northern China.

INDIA.

Mr. H. Cottam, a Ceylon planter, accompanied by another Englishman, made an unsuccessful attempt to explore a new overland route from India to China. They started from Assam and traveled by the Tonga River, intending to make their way into the Chinese province of

Yunnan, but failed to do so. In the course of their journey they visited the Sacred Pool of Brahma, which is fed by the waters of the Brahmaputra.

CHINA AND BURMAH.

Lieut. Gill, R.E., left Shanghai and made his way to Cheng-Tu, 31° N. lat., 105° E. long., and from there made a long, perilous and arduous journey over land to Burmah, terminating at Rangoon. He describes his journey from Cheng-Tu over this long distance, which was through the Chinese province of Sz-Chuen, as like continually ascending a staircase. There were no roads, the way consisting of mere tracks through a rocky, mountainous country. About Bathang, 30° N. lat., ranges were crossed 15,600 feet high. The natives throughout the journey he found quiet, and as Lieut. Gill is not only a very enterprising, but a scientific traveler, he will no doubt have gathered a great deal of interesting geographical information.

CAMBODIA AND SIAM.

Dr. Harmand, to whose labors in Eastern Asia I have heretofore called attention, went from Sargon in Cochin China upon a scientific exploration in Upper Cambodia. He explored the meridional basin of Se Moun, a westerly tribute of the Mekong, between 14° 30′ and 15° 30′ N. lat., traversing many rivers, the chief among which was the Se Te Moun and Shing Selane, being the first traveler who has crossed the watershed between the Mekong and the South China Sea.

He discovered in his journey a pass 780 feet above the sea-level. He found some insignificant ruins, and thinks that this upper region contains no important remains of Cambodian art. He crossed the remarkable island east of Bassak, and at last succeeded in reaching Anan from the basin of the Mekong.

JAPAN.

Herr E. Knipping has been engaged in extensive surveys in Japan, and has completed a large map of the country, which will soon be published. He was last surveying a route from Kobi to Tokio, a distance of over 3,000 miles.

Mr. Wojeikoff completed his meteorological journey round the world, during the course of which it will be remembered we had the pleasure of seeing him at one of our geographical meetings. His last visit was to India, Java and Japan, and he made an excursion into a part of the interior of Japan never before visited by Europeans.

AFRICA.

STANLEY'S EXPLORATION OF THE CONGO.

The great event of the year is Mr. Stanley's exploration of the Congo. When I referred to Mr. Stanley, in my last address, he had finished his expedition of Lake Akengara, southwest of Lake Ukerewe (Victoria Nyanza), and was on his way to Lake Tanganyika to explore the country south of the Lake Mwutan Nzige (Albert Nyanza), and northwest of that lake, in the hope of reaching the Mombutto country at the north, so as to connect his own discoveries with those of Schweinfurth, across the equator.

It will be remembered that I mentioned last year that Lieut. Cameron circumnavigated Lake Tanganyika, and concluded, from his own observation, that he had discovered the outlet of the lake in the river Lukuga flowing from it on the western side. An ordinary traveler would have been satisfied with Cameron's survey, and his conclusion as to the outlet; but Stanley, in the true character of a geographical explorer, determined to go round the southern part of the lake himself, and the result of his doing so was that he ascertained by a detailed survey and careful soundings,

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that the river Lukuga, instead of flowing out of the lake, flows into it; that it was, in fact, an affluent, and that the lake had no outlet, unless a temporary one should occur, as Burton had already suggested, by a rise in the elevation of the lake in seasons of great rain; Cameron, in his observation, having probably been deceived by the influence of the wind on the surface of Lukuga, which gave the river the appearance of flowing into the lake. Stanley also found that the lake was steadily rising, as the beach, where Cameron drew up his canoe, was then five feet under water.

After completing this work, Stanley started with a force of 140 porters for Nyangwa, the farthest northern point attained by Livingston or Cameron; carrying his boat, the *Lady Alice*, with him in sections, which point he reached in November, 1876, after a journey of about 350 miles in forty days—in itself, a remarkable geographical feat. Nyangwa, which he ascertained by observation to be 4° 15′ 45″ south latitude and 26° 5′ east longitude, is situated on the Lualaba of Livingston, the river there having a width, in the rainy season, of about two miles, with a volume of water of 240,000 cubic feet.

Here he learned that Cameron had been there, and being unable to ascend the Lualaba in its northerly course, had started upon his remarkable journey for the Atlantic coast. Not believing, as Livingston did, that the Lualaba was the remote southern branch of the Nile, but having the same conviction as Cameron, that it was connected with the Congo, and was the eastern part of that river, and having, what Livingston and Cameron had not, an ample force and sufficient supplies, he determined to follow the Lualaba and ascertain whither it led. He met with the same difficulty that Livingston and Cameron had encountered in the unwillingness of the people to supply canoes. They informed him, as they had the two previous explorers, that the tribes dwelling to the north on the Lualaba were

fierce and warlike cannibals, who would suffer no one to enter their territories, as the Arab traders had frequently found to their cost; that between Nyangwa and the cannibal region the natives were treacherous, and that the river ran through dreadful forests, through which he would have to make his way; information which afterwards proved to be true. He nevertheless resolved to go, but it was not easily accomplished, as the people of Nyangwa filled his followers with terror by the accounts they gave of the ferocious cannibals, the dwarfs with poisoned arrows who dwelt near the river, and the terrible character of the country through which they would have to pass; which had such a disheartening effect upon them that difficulties arose which would have been insurmountable to any one but a man of Stanley's indomitable perseverance, sagacity and tact. He overcame all obstacles, succeeded in getting canoes, and in engaging an Arab chief and his followers to accompany him a certain distance, an increase of his force which gave confidence to his own people.

Those only who are acquainted with the dangers and difficulties of African exploration, and who know how frequently the most sagacious conclusions, founded upon what seemed to be reliable information, has not only been attended by failure, but with the most disastrous results, can fully appreciate what Stanley under-took, and the hazard he ran in determining to follow the river in its northerly course. The river ran to the north, apparently in the direction of the sources of the Nile. He had Livingston's conviction that it was the remote source ot that river. He knew nothing of the fact that the southern part of the Mwutan Nzigi (Albert Nyanza) had been explored by Gessi, and that no large river flowed into it. The theory, moreover, that he had formed of the course of the Lualaba was different from that of Cameron's; Cameron's conclusion being that a little above Nyangwa it turned to the

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west and flowed into the Atlantic coast; whereas Stanley's conviction was, as subsequently proved to be the fact, that it flowed on to the north, beyond the equator, and then turned to the west as part of the Congo. To follow the river, however, in its northerly course, might lead him, if his theory should not be verified, into the interior of Northern Africa, where he would be, with a large body of followers, without supplies, and in a state of utter destitution.

He fully appreciated the great risk he ran. It was to him a matter of painful and anxious thought, but after fully considering it in all its bearings, he came to the bold and fixed determination to follow up his theory, and in this, exhibited the same geographical instinct which he has referred to as such a remarkable faculty in Captain Speke, the discoverer of Lake Ukerewe. Writing from Nyangwa, he says: "I am determined to stick to the Lualaba, come fair or foul, fortune or misfortune. I have supplies for six months; beyond that, Heaven knows what will become of us if we should find the Lualaba running into some unknown river, with not a single bead or cowrie with which to buy food."

He accordingly started to follow the river to the north. The first three weeks of the journey was disheartening, confirming all that they had heard of the difficulty of passing northward along the river; so much so, that they had to abandon it and make their way through dense and gloomy forests, which, at last, had such an effect upon his followers, that they began to talk of returning. This disposition becoming general, he resolved to try the river, and after much persuasion, argument and deliberation, his proposal was acceded to, and they reached it at a point 3° 33′ 17″ south latitude, being 41 geographical miles north of Nyangwa. Here his little vessel, the *Lady Alice*, was put together, and then he says, "I formed the resolution never to abandon the Lualaba until I learned its destination."

He made an encouraging speech to his men, telling them that they had promised at Zanzibar to follow him for three years wherever he might want to go; and that there was still one year left. "I will not," he said, "leave this river until I reach the sea, and I promise you that we shall reach it before the year is out. All I ask of you is to follow me in the name of God," upon which fifty of the youngest stepped forward and shouted out, "In the name of God, then, master, we will follow you."

Their first attempt to navigate the river verified what they had heard of the treacherous character of the natives. They invited the white man to what is known in Africa as blood-brotherhood, and after Pocock, Stanley's associate, had gone with ten men to an island, to undergo this rite, Stanley ascertained that the intention of the natives was hostile, having discovered thirty armed canoes proceeding in the direction of the island, and sounding the war cry. He was enabled, however, by a vigorous movement, to reach the island, to rescue Pocock, and to get safely down the river, as his force of 500 men, armed as they were, was too powerful for the assailants. They now passed along the river in two divisions—one by land, along the left bank, and one by water. The land party was vigorously attacked, but succeeded in defending themselves until the water division approached, when the natives retired. They now reached a part of the river where it is obstructed by a long succession of cataracts, which Stanley calls the Falls of Ukassa. Here their progress was again disputed by a body of armed natives, but they succeeded in passing down the river without loss. As they continued to descend they were constantly met with hostile demonstrations and attacks throughout their course. All their attempts at friendly intercourse were met by showers of poisoned arrows, and the land party was again attacked. To add to their trials, the smallpox broke out among the Arab escort, and there were eigtheen deaths

in three days; whilst others of the party were attacked by dysentery, and ulcers appeared upon the limbs of many, in consequence of their severe marching; so that when they had reached the distance of 125 geographical miles north of Nyangwa, their boats, in Stanley's language, "were little less than floating hospitals." Seventy-two died with the smallpox alone, and while in this condition they were again attacked by the natives, in continual assaults, for two days and two nights, both by land and by water, the whole country being up in arms against them. So constant were these attacks that they were unable to bury their dead, or attend to those who, having been wounded with the poisoned arrows, had become delirious from the poison. Having passed this peril, their Arab escort resolved to leave them, and Stanley feared that his own followers would also return; but at this critical moment he says they stood firmly by him. He had taken them, they said, through much trouble, and, please God, they would take him to his white brothers on the sea. As they had been faithful to the white man Livingston, so would they be faithful to him. His own force consisted now of 146 persons, but the departure of the Arab escort was a moment of great trial. When his people heard the farewell song of the escort, as it came, in Stanley's language, "in wild and weird-like tones over the water," they wept as though their hearts would break. "It was," he says, "the saddest day I ever passed in Africa."

On January 4, 1877, they approached a long series of cataracts, or, more properly, falls, and entered the dreaded cannibal regions. Here, he says, they were hunted, night and day, like game, breaking four times through lines of hostile canoes, brought together to obstruct their passage down the river; and they continued under these incessant attacks until they reached what he calls Baswa Falls, which is close to the equator, 0° 32′ 36″ S. lat.

Return was now impossible, as they could not pull their vessels up against the stream, with the additional impedi-

ment of the constant attacks of the natives. For twenty-four days they had, he says, fearful work in repelling these constant attacks, and in searching for food. In getting over a distance of 42 geographical miles, they had to go around six falls, to drag their canoes more than 30 miles by land, and to cut a track of 13 miles through a dense forest, to transport the *Lady Alice* around the cataracts. After passing the cataracts, they had a short period of rest, after which the voyage upon the river was resumed, and was found safer, though the tribes on both sides still continued hostile. At this point, which was beyond the equator, in 0° 14′ 52″ N. lat., the Congo gradually widened until it became a noble river, and when they had reached between the 24th and 25th degrees of North longitude, they came to a magnificent tributary flowing into the river, with a width of 2000 feet, which Stanley supposed might be the Welle of Schweinfurth, or else a river from the estuary he had discovered, south of the Mwutan Niziji, which he named Beatrice Gulf. But this tributary, which is called the Aruwima, is probably, as Dr. Peterman has suggested, the great river in the central part of North Africa, known to Barth as the Kubanda, and to Nachigall as the Dahar-Kuta, running south of Darfour and Wadai, in the vicinity of 4° N. lat., which is reported, upon Arab information, to have a width in different parts of it from two to ten miles. As they approached the mouth of the large affluent which flowed into the river, they were suddenly attacked by a force of fifty-four armed canoes, that rushed down upon them with such fury that four of their canoes became panic-stricken. One of these hostile canoes was of great size, being propelled by about 80 paddles and was guided by eight steersmen, with a planking in front holding about ten men armed with spears, and a planking along its sides, traversed by armed men. "In a second almost," he says, "we were surrounded, and clouds of arrows were darted upon us for ten minutes;" but after a very se-

vere contest, which at times was somewhat doubtful, these formidable assailants were repulsed, and the explorers proceeded in safety down the river. He was now, however, in doubt what to do—whether to go up the great tributary which they had found—the Aruwema, which at one time, Stanley thought, might be the Congo. The whole river, to increase their embarrassment, widened out at this point, and was filled with many islands; and as a passage through those islands formed an easy means of escaping, he determined to take that course, "for nature," he says, "could not sustain such a strain as we had undergone."

On reaching very near the second parallel of N. lat., the river made a great curve to the west, and then flowed southwesterly with a width varying from two to ten miles, and was filled with islands, between which he was enabled to pass with less danger. Here a new trial awaited them. All attempts to communicate with the natives had proved fruitless, and they had now before them the peril of starvation, having passed three days without food. In this state of desperation they determined, whatever might be the consequences, to go to a village which they saw on the left bank, which they did, and where to their great joy they found natives who were friendly, having had some intercourse with the Atlantic coast. He asked the aged chief of this friendly people what was the name of the river. The old man answered, "Akuta-ya Kongo" The great problem was solved; the Lualaba of Livingston and the Congo were the same river.

They were yet, however, 850 miles from the Atlantic coast, having come, thus far, 900 miles along the river from Niangwa. After a period of rest, and obtaining supplies, they again set forth, supposing that all their perils were now passed; but in three days afterwards, on entering the dominions of a powerful chief, fifty-four canoes, more formidable than any which they had yet encountered—for the men in them were armed with

muskets—came and attacked the nineteen canoes of the expedition; upon which a desperate running fight took place, the result of which was several times very doubtful, and was continued for the long space of twelve miles down the river; this being the last of thirty-two separate attacks that had been made upon them since leaving Nyangwa.

Their further course down the river was attended by no more hostile assaults from the natives; but a peril of a different character now awaited them. After they had passed a distance of about 1,480 miles the river straightened and became narrow, between close-meeting cliffs of naked, craggy rock; and its further course was obstructed for a considerable distance by a succession of cataracts and whirlpools. Being deceived, Stanley says, but in which he is certainly mistaken, by Captain Tuckey's map, who, in 1816, had explored the Congo from its mouth to a point somewhat below these cataracts, they proceeded confidently along this part of the river, which has thirty falls and rapids, in descending which Pocock, Stanley's white companion, and the ten natives who were with him, lost their lives, having been carried over the cataract; and Stanley, in the *Lady Alice*, and those who were with him, escaped the like fate almost by a miracle. After getting through all this, they were again brought to the very verge of destruction for the want of food; but fortunately a messenger whom they had sent in advance to Emboma, a trading place situated on the river below the cataracts, reached the agency of some Liverpool merchants, who promptly sent abundant supplies, which reached the explorers when they were on the very verge of famine and thoroughly broken down by exhaustion, fatigue, and the want of food. They finally reached Emboma, from which communication with the Atlantic coast is easy, and which they reached in August, 1877, having made a journey from Nyangwa down the river to its mouth of about 1,800 miles, and passed fifty-seven cataracts.

Stanley's own words will best describe their condition through the principal portion of this terrible journey. "On all sides," he says, "death stared us in the face, cruel eyes watched us by day and by night, and a thousand bloody hands were ready to take advantage of the least opportunity. We defended ourselves like men who knew that pusillanimity would be our ruin among savages to whom mercy is a thing unknown. I wished naturally that it might have been otherwise, and looked anxiously and keenly for any sign of forbearance or peace. My anxiety throughout was so constant, and the effects of it, physically and otherwise, have been such that I now find myself an old man at thirty-five." It will be remembered that, when we saw Mr. Stanley here in the Society, his hair was black; it is now said to be entirely white. Of the 350 men with whom he left Zanzibar, in 1874, but 115 reached the Atlantic coast, and 60 of those, when at the journey's end, were suffering from dysentery, scurvy, and dropsy. He was on the Congo from November 1, 1876, to August 11, 1877—a period of over 9 months; so that his promise to the native followers was fulfilled, that he would reach the sea before the close of the year.

GEOGRAPHICAL RESULTS OF STANLEY'S EXPLORATION.

It remains but to refer to the geographical knowledge which has been obtained by this remarkable exploration. The entire area drained by this great African river, Stanley computes at 860,000 square miles, 450,000 square miles of which is taken up by the great basin and the maritime regions of the west. The source of the Congo, as now ascertained, is in the high plateau south of Lake Tanganyika in a country commonly called Bisa, or Ubisa. It issues from Lake Bembo, called by Livingston, who discovered it, Bangouelo. This lake is a large body of shallow water, and is the residum, as Stanley thinks, of an enormous lake that

existed there at a former period. After issuing from Lake Bembo, the river is known by the name of the Luapula, which, after a course of nearly 200 miles, empties into lake Moero, a body of water of about 2,800 square miles. Issuing from this latter lake it takes the name of the Lualaba, and has an important tributary called the Kamalonda. Under the name of the Lualaba, the river flows in a direction north by west, with a breadth of about 1,400 yards at Nyangwa. Stanley computes its distance from its extreme source in Eastern Bisa to Nyangwa at 1,100 miles, and its course from there to the Atlantic at 1,800 miles, or in all 2,900 miles, showing it to be among the largest rivers of the world. A short distance north of Nyangwa the river inclines east of north and has many impediments, such as high spurs from the hills along its banks, and wild places of foaming water. Here along the river banks, fishermen dwell, called Wagenya, a crafty treacherous cowardly tribe, inaccessible to any gentle influence. Beyond them there is a large, courageous tribe, called the Warongora, who inhabit a considerable extent of the river on the right bank. As the river inclines to the west beyond the equator, in 27° E. long, are the cannibals or war-like Bakasu, upon whom he says a congress of bishops and missionaries could produce no effect. At 26° E. long. the river begins to receive great affluents, and there are many smaller streams constantly visible in descending. In his opinion it drains the entire western portion of the lake regions as far as 4° N. lat. He thinks, from the great width of the Aruwimi, that it will prove of immense value hereafter, as it is open to any vessel on the Upper Congo. He thinks they may have passed many other important tributaries in the region of the equator, as the river spreads out there to an enormous breadth, having sometimes a dozen channels, and which at first he mistook for distinct rivers. The resistance he met with he attributes to the fact that no tribe penetrates beyond its own limits, trading being conducted

from tribe to tribe, the balance of power being pretty evenly maintained between them.

On the left bank of the river, in about 20° E. long., the Ikelemba flows in from the south, which, he says, is the greatest affluent of the Congo, and which he thinks is the Kasai that Livingston crossed in his journey in 1854.* The water of this great Southern tributary, which is of a tea color, does not mingle with the silvery color of the Congo until after a distance of 130 miles from its mouth; and it is, he says, the union of these two rivers, which gives to the lower Congo its light brown color. After passing 18° E. long., they come to a stream 500 yards wide, called by the natives Nkutu, but which he thinks is the Kwango of Cameron. As they descended beyond 17° E. long., the Congo spreads out into an enormous breadth and then slowly contracts between hills, when it thunders down, steep after steep, for 180 miles, and then flows as the majestic and calm lower Congo. In this 180 miles it has a fall of 585 feet. He found the people in this region very

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* NOTE.—Before Stanley had reached the Atlantic coast, intelligence was received by the Lisbon Geographical Society that a Portuguese merchant had found the source of the Congo, in a river which takes its rise in a spring, which is twenty days' march in an easterly direction from Melange, on leaving which, according to his information, the river flows to the north, and is then called by the natives Kassi, until it crosses the territory of Lunda, when it takes the name of Nzare, very like its ancient name of Zaïre. This is evidently the river which Livingston crossed and considered a branch of the Congo, and which Cameron found in about 11° 12′ south latitude, and 21° 10′ east longitude, in crossing the water-shed where rise the sources of the Liambai, an upper branch of the Zambesi, and which river he represents conjecturally upon his map as rising in about 12° south latitude and 19° east longitude; and thence running north with many affluents, to what he marks as the position of Lake Sankorra, in 5° south latitude and 22° east longitude, which lake, he supposed, was connected with the Congo.

The course of the Portuguese traveler eastward is difficult to trace in the imperfect account given of it; but what he probably met with was one of the sources of this river, which would seem to run somewhere near the position where Stanley found the Ikelemba flowing into the Congo.

friendly. It is navigable for 110 miles from its mouth to the first rapids and beyond them for 835 miles, while the great affluents he estimates which flow into it from the north and south would give 1,200 miles and perhaps more. He estimates its greatest affluent, the Ikelemba, to be over 1,000 miles in length, the Nkutu or Kwango to be over 500 miles, while there are four or five others which, from their breadth, he thinks, should be navigable for great distances. The Nile, he says, has greater length than the Congo, but that the Congo could furnish water for three Niles, and that it is a much more valuable river for commerce than the Nile, as the Congo has its rapids concentrated in two places, and is not, therefore, like the Nile, frequently interrupted by rapids. The upper rapids, where all navigation westward on the upper Congo terminates, has six great falls, while the lower series has sixty-two important falls and rapids, with many minor ones. Once above the lower cataracts, he says, we have the half of Africa before us, with no interruption, like the desert regions of the Nile, but one vast populous plain; no part of Africa with which he is acquainted being so thickly inhabited. The term villages, he says, can scarcely be applied, for it is a collection of dwellings; and there are towns in some places two miles long, with one or more broad streets, and rows of neat and well-built houses, superior to anything to be found in Eastern Africa.

Fault has been found with Mr. Stanley, especially in England, for the warlike contests and destruction of savage life that attended his exploration, which it has been said will make it difficult for any future explorer to follow in the same direction, and which the objectors attribute to a too ready disposition on his part to employ fire-arms, instead of trying conciliatory measures. In this respect an unfavorable comparison has been made between his journey across Central Africa and that of Lieut. Cameron, in whose track any one may hereafter peacefully follow. But the condi-

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tions in the two cases were not the same, and this condemnation of Mr. Stanley is, in my judgment, very unreasonable. What Stanley encountered in the regions traversed was what the people of Nyangwa told both Livingstone and Cameron they must expect to find if they attempted to follow the Lualaba in its course to the north, and that it should be so in the vicinity of the equator was to be expected, independent of their information. For a century at least, and probably long before, Arab slave-traders have harried and desolated the interior of Central Africa, north and south of the equator, in the prosecution of their cruel and infamous traffic, but have never been able in their slave raids to penetrate the region in the vicinity of the equator, either from the north or from the south, even with the advantage of fire-arms, having always been resisted by the warlike people who dwell there. Strange, moreover, as it may appear, the cannibal tribes of Africa, as we know from the journeys both of Du Chaillu and Schweinfurth, are highly intelligent, brave and honest; and when Stanley, a white man with a body of followers, entered their country, the conclusion on their part was a most natural one, that he and his party were slave traders, whose attempt to get into the country was to be resisted by every means within their power. He was therefore attacked in the beginning, and continued to be attacked until he came to that part of the river where natives dwelt who had intercourse with the Atlantic coast, and as he has stated, and as there is every reason to believe, he acted throughout entirely on the defensive.

In no other way would it have been possible for him to have followed the river as he did for 1,800 miles, and none but a man of his indomitable perseverance, courage, sagacity and tact could have carried through such an exploration, which is one of the most remarkable on record. When his exploration of the Congo is taken in connection with what he previously did in finding the far southern sources of

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the Nile, in the river Shimeeyi that flows into the southern part of Lake Ukerewe (Victoria Nyanza) and in the tributaries of that river; his successful circumnavigation of Lake Ukerewe; the investigation of its affluents, especially the Kitaugule or Kagera, and what he ascertained in respect to Lake Tanganyika, both on his first and his last examination of it; it may be truthfully said that no one man has ever, in explorations upon the land, done so much for the acquisition of geographical information. In respect to the great water system of Africa, in its connection with the mystery of the Nile, and the mystery of the Congo, he has solved an enigma that has engaged the attention of the world for ages, and fixed his name in the foremost rank of geographers, explorers and travelers.

RIVER OGOWAI.

The details have transpired, during the year, of Lieut. Brassi and M. Marche's explorations of the River Ogowai, which enters the Atlantic close to the equator, and the head waters of which are, as we now know, in the country through which the Congo flows. Lieut. Brassi explored the Ogowai for 458 miles from its mouth to the Falls of Doumie, 0° 76′ N. lat. and 13° 20′ E. long., the limit of the country of the Adoumas. M. Marche, who was the naturalist of the expedition, reached further, getting to the little island called Dzansgi beyond an affluent named the Lecabo, where the Ogowai turns to the south southeast in a naked looking country of massive mountains, the direction of which Mr. Marche could not trace. From the united descriptions of Lieut. Brassi and Mr. Marche, the Ogowai partakes of the general character of African rivers, being obstructed in the upper portion of it with rapids and falls, which make it of little practical use as a navigable stream for communicating with the interior. Near the Atlantic it runs through flat and marshy lands for

a considerable distance; a large tranquil stream without rocks or sand-banks, or any obstruction, until the rapids are reached.

RIVER VOLTA.

Mr. Bonnat has given a full account of his explorations on the River Volta, on the western coast, and speaks very highly of the Ashantees, whom he declares to be the most civilized of all the negro tribes.

PORTUGUESE EXPEDITION TO THE WEST COAST.

The Portuguese sent an expedition to the east coast of Africa for the exploration of the territory claimed by them on the west coast. They claim the exclusive navigation of the Congo, as well as other portions of the western country; their right to which, in the present age, however, will scarcely be admitted, unless connected with actual occupation. The wholesale manner of claiming vast interior regions of a great continent, on the ground of having made settlements upon the coast, which characterized an earlier age of geographical discovery, when the surface of the globe was imperfectly known, cannot be recognized now. The Portuguese, after their long inertness in respect to that portion of the interior of Africa lying beyond their settlements on the east and west coasts, are now taking active measures for the geographical exploration of what they regard as their possessions, and the Government has made a grant of $100,000 for the geographical exploration of the interior.

An expedition started under Mr. Gorpas for the survey of a railroad between Leonda and Ambaca; and another left afterwards for the region of the Ango. The expedition of the west coast will enter at the mouth of the River Simbue, or Cunene, 18° south latitude, and will explore the river to its sources. From Bihe, it will proceed to discover and explore

the Cubugo, the source of the Quango, and also the Mossambo Range; then, by way of the upper sources of the Zambeze, it will proceed to Lake Bembo or Banguelo; from thence to Lake Nyassa, crossing that lake, and then proceeding to Mozambique. The chief object of the expedition is to report upon the most practical route from the west to the east coast, and on the commercial relations between the Portuguese coasts east and west, and the rich central region between them.

PIAGGI'S SURVEY OF LAKE IBRAM.

Piaggi has examined Lake Ibram, discovered by the American explorer, Colonel Long, whom we have the pleasure to have with us to-night, and found it to be from thirty-two to thirty-five miles in length, running from N. N. W. to S. S. E., and from twelve to fifteen miles in breadth; the southwestern half being studded with islands. The Somerset Nile enters it on the northwest and flows out again from the northern extremity.

LAKE NYASSA.

E. D. Young, R. N., has given during the year an interesting account of his journey around Lake Nyassa. He says that an enormous population existed in the neighborhood of the lake, which was harried and diminished by tribes engaged in supplying the Portuguese with slaves, in the slave trade carried on by them on the Zambese, and says that neither Portuguese nor Arabs would encourage any other trade. He describes a spot, the scene of a slave raid, where skeletons were lying in all directions, and says that the rule of the traders is to slay every adult without mercy that is not fitted for the slave market. He is not surprised at Livingstone calling his discovery "the lake of storms;" for gales, he says, come upon this inland sea without any warning, and are at times furious. He de-

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scribes the mountain ranges which virtually make a mountain basin of Lake Nyassa, as exceeding anything he has ever seen in any part of the world in stupendous grandeur. Peaks rise to 10 and 12,000 feet high almost perpendicularly from the lake; and during the rainy season waterfalls hang upon these mountain sides like threads of floss silk. He puts down the traffic in slaves at the large number annually of 10,000, which shows how rapidly this fertile and salubrious region of Africa is becoming depopulated by this infamous traffic.

Mr. H. B. Cotteral made a voyage along the west coast of Lake Nyassa, in the course of which he examined Lake Chia, and then passed to Macuai, on the great bay of the northwest coast. He found the northern shores of the lake more productive than the southern, which is in conflict with the information received from Mr. Young, and he also learned that the Rouma flows into and not out of the north end of the lake.

MR. PRICE'S JOURNEY FROM SADANI.

The difficulty of journeying in Central Africa, from the east coast, in the neighborhood of Zanzibar, are as formidable as in any part of the world. The distance to Tanganyika is about 700 miles, and that journey is seldom accomplished, unless at an outlay of about $5,000, the whole carriage being by human beings, who give indescribable trouble, and involve a large expense and great delays.

Under the direction of the London Missionary Society, Mr. Price undertook the experiment of ascertaining whether the system of wagons, drawn by bullocks, so common in South Africa, would not be practicable along the entire route. He accordingly trained bullocks and started from Sadani, with an expedition of thirty men and four oxen, with which he made a journey of 200 miles in twenty-six days, which, with his return, completed a journey of 400

miles in forty days, and ascertained the important fact that this mode of travel could be successfully accomplished, from the absence of the Tsetse fly, so fatal to cattle in certain parts of Africa; his four bullocks having returned to the coast in perfect health. The result of this experiment is, that the London Missionary Society has sent out an expedition from Zanzibar on this plan, to Lake Ukerewe (Victoria Nyanza), which, when last heard from, had reached the lake, and crossed it to Mtesas' dominion at the northern end of it.

LAKE MWUTAN NZIGI (ALBERT NYANZA).

Col. Mason, a scientific officer of Col. Gordon's staff, circumnavigated the Mwutan Nzigi, and found that the lake extends fully two degrees further south than the limits assigned to it by Sig. Gessi, upon his exploration.

Dr. Pogge, who made a journey to Nusumba, the capital of Mutav Yambo, described the climate as healthy, and declared the route followed by him to be one very advantageous for future explorers. Before the discovery of Stanley, he gathered from the information which he collected, that the Kassai was one of the main branches of the Congo. He found that the Luenda was known as the Nzare, which is very like the old name of the Congo, the Zaire.

Dr. E. Holub, who is known through previous explorations in Africa, has examined, in South Africa, the country north of the Zambesi, and towards Lake Banguelo, and collected valuable information respecting the course of rivers, the languages spoken, the manners and customs of the natives, united with botanical labors and researches in natural history; and Dr. Kutanberg has also been engaged in the tributaries of the Zambesi, in botanical labors.

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MADAGASCAR.

Within the last two years five journeys of exploration have been made into new parts of Madagascar.

The information gathered in these various explorations is very extensive and interesting, especially in respect to the mountain structures in the southeastern part of the island, conspicuous among which is Trohibe, an enormous isolated mountain with a large top, in the centre of a great plain, which rises up like a fortress, and has a lake upon its summit that overflows and forms a cascade on the north side of the mountain. The luxuriance of the vegetation in the valleys is especially dwelt upon. The southwestern portion, Sakalava, was explored, as well as the north side of the central plateau. It appears from these explorations that civilization in Madagascar has spread from the centre of the island. The capital, Antanarivo, a city of about 80,000 inhabitants, is the centre of this movement, and is to Madagascar what Paris is to France. Madagascar, though of great interest in the fifth century, created very little afterwards until attention was specially called to it by the work of Ellis, since which it has attracted geographical explorers, through whom and the missionaries the whole area has been opened up, so that travelers can now pass through all parts of it, and the island is now being penetrated in various directions, though a great part of it still remains a blank upon the map.

AUSTRALASIA.

SUMATRA.

The Dutch expedition for exploring the interior of Sumatra, to which I have heretofore referred, started last May for the interior, and succeeded in penetrating

into the jungle to the centre of the island, a region hitherto unknown, where they found large mountains, covered with thick vegetation. They met, however, with a great loss in the death of their leader, Mr. S. Landbort, a man of extensive knowledge and indomitable perseverance, to whose ability the success of the bold journey across the middle of the island was chiefly due.

JAVA.

M. Raffiry ascended the mountains of Java, which he describes as covered with immense forests. From the summit which he reached, at a height of 9,000 feet, he found below him a magnificent plain surrounded by mountains.

NEW GUINEA.

The Rev. S. McFarland has made a voyage in the steamer *Ellengowan* to the Chinese Straits, in New Guinea. At Hood Bay he was received very kindly by the natives, and ascertained from them that a river runs at the eastern side of the bay, having its rise in the Astrolobe range. He continued to Cloudy Bay, and from there to Dufaure Island, close to which he found a fine harbor. Along the coast between Amazon Bay and the Chinese Straits he found the natives more numerous, intelligent and healthy than on the west coast. They had plenty of food, and brought some flax of a very superior quality. The geographical result of his voyage is the discovery of two splendid harbors, besides several good anchorages along the coast.

Mr. G. Law also made a voyage to Hood Bay, and near it discovered the mouth of two rivers.

Signor Alberto ascended the Fly River in a steamer for seventy miles, to 5° 30′ S. lat. and 141° 30′ E. long., when he was compelled by rapids to return. In descending, a tributary of the Fly, running from the northwest, was explored

for forty miles, when he was again compelled by the same cause to return. The general appearance of the country visited was low and swampy, and some mountains were seen in the distance.

Mr. Macluco Maclay, the Russian explorer, has during the year revisited the part of New Guinea which bears his name, and continued his researches to the Pelew Islands.

AUSTRALIA.

The Hon. T. Elder, of Australia, with enlightened liberality, sent an expedition at his own expense across the continent of Australia, from Adelaide to the settlements on the western coast, with the view of ascertaining the pastoral capability of the unknown region to be traversed. The expedition was entrusted to Mr. E. Giles, with whom was associated Mr. Taitnor, as first officer, and Mr. Jesse Young, whom we have recently had the pleasure of seeing in our society, who was the astronomer and naturalist of the expedition. Their route was northwest of Fowler Bay, across the great sandy desert between Southern and Western Australia. The country traversed for more than 1,000 miles in a straight line was found to be an undulating dense scrub, a treeless, waterless waste, except between 125° and 127° E. long. and 30° S. lat., where an arm of the great southern plains about 30 miles wide crossed their track, dividing the region into two deserts, where for hundreds of miles no water was to be found. After passing this grassy interval, they traversed a desert for 180 miles, when they came upon an immense mass of granite, and for the first time met natives, who attacked them, but were easily repulsed, and after a journey of 196 days, from Youldeh, the point of departure, somewhere near the 130th meridian and the 30th parallel, they reached Perth, the capital of Western Australia, where they were received with public rejoicings.

The homeward journey was about 400 miles north of the outward route. It was from Perth northward to the Ashburton River, beyond Mount Laubouchere, and from thence between the 24th and 27th parallels of latitude to the Peake telegraph station, there being now a telegraph line, 1,800 miles in length, across the whole continent of Australia, from Adelaide to Port Darwin on the north coast.

The country traversed in the homeward journey was also an arid waste; their conclusion being that there is in this part of Australia a vast desert of a triangular form, the base of which is near the shore of Lake Torrens.

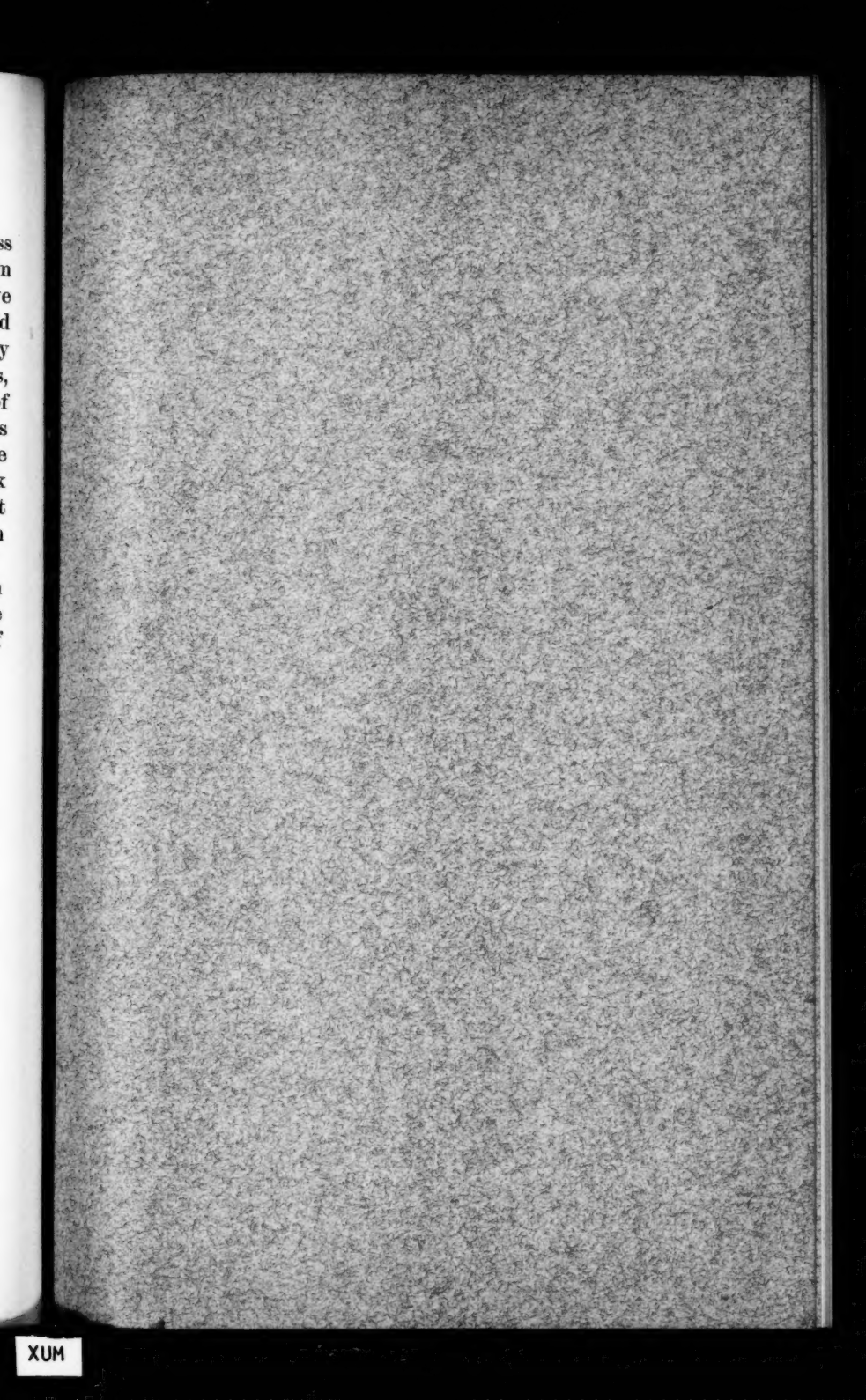
The explorers in their route came across a remarkable dam and tank, erected by the natives for storing water, with a clay circular wall around it five feet high, which Mr. Giles says is astonishing, considering that it is the work of the aborigines. The journey was one of great hardship and suffering. They could not travel by night through the dense spinefex grass, and the journey had to be by day, under a burning sun, with the thermometer at 102° Fahr. in the shade, and but a scanty supply of water. They passed over 220 miles, through, Mr. Giles says, the most terrific scrub, without finding a single water hole, during which three of their horses died of thirst, and the whole party would have met the like fate had not the camels held out until a clay pan of water was fortunately discovered. They are, exclaims Mr. Giles, "wonderful, awe-inspiring, marvellous creatures, and I never praised God so much for anything before."

CROZET ISLAND.

Capt. L. Brino, R.N., has visited the Crozet Islands, 47° 9′ S. lat., 50° 57′ E. long., in H. M. S. *Wolverine*. The first island visited is Possession Island, the largest of a group at Nairne Bay. When they landed they were surrounded by animals who had not the slightest fear of the men or

their guns. Hundreds of seals resting on the damp grass made no effort to escape, nor did the albatross move from their nests when approached. The whole bay was alive with birds, the albatross, petrel, pigeon, gull, duck, and others. They observed upon the beach a hut, which they entered. It was rudely constructed of the staves of casks, had six berths, with a stove ingeniously constructed out of an old fish kettle. There was a number of empty casks lying around, and two whale boats were hauled up on the beach, one of which was useless. The name of J. A. Brink was cut on the door of the hut, but they found no document or anything further to indicate by whom the hut had been inhabited.

And here, in these far-off islands of the South Indian Ocean, where the repose of nature has been so little disturbed by the presence of man, I will take my farewell of the geographical work of the year 1877.



American Geographical Society.

No. 11 West 29th Street.

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THE OBJECTS OF THE SOCIETY are to encourage geographical exploration and discovery; to investigate and disseminate new geographical information by discussion, lectures and publications; to establish in the chief maritime city of the country, for the benefit of commerce, navigation, and the great industrial and material interests of the United States, a place where the means will be afforded of obtaining accurate information for public use of every part of the habitable globe. The Society has been in existence twenty-six years. It has a geographical library of thirteen thousand volumes, and a large and very valuable collection of Maps, Charts, and Atlases relating to every part of the world. It publishes a Bulletin, an annual Journal, and co-operates and interchanges information with thirty-three foreign Geographical Societies.

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